



Physiotherapy in people after total laryngectomy: a narrative review

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Abstract:

Total laryngectomy is a surgical procedure that consists in the removal of the larynx used in patients with advanced laryngeal cancer. A tracheostomy is also required, which means that after the procedure, breathing will be done while bypassing the mouth, nose, and throat. After the procedure, patients are unable to speak, their swallowing and taste are impaired, the appearance of the face changes, the patient's body posture is disturbed, whereas postoperative scars limit the range of motion within the neck and shoulder girdle. In addition to surgery, radiation, and chemotherapy, modern standards of cancer treatment include physiotherapy, which has become an indispensable element of comprehensive rehabilitation at every stage of medical management. The paper presents the basic health problems of patients following the surgeries that occur in the motor, respiratory, circulatory, digestive, and sensory systems as well as communication difficulties. The main goal of physiotherapy in patients with laryngeal cancer is to prevent complications and functional disorders. The paper presents a tabular summary of the physiotherapy used in patients after total laryngectomy divided into preoperative, postoperative hospital, postoperative inpatient, and late postoperative periods. Therapeutic recommendations and goals that can be achieved in individual periods were defined. The need to individualize physiotherapeutic procedures and the importance of physiotherapists in the psychoeducation process were also indicated. Properly conducted physiotherapy helps reduce pain and sensory disturbances, improves the performance of the musculoskeletal system and reduces anxiety. The above-mentioned elements of therapy have an impact on the achievement of the main goal of the treatment of patients following total laryngectomy, which is to achieve the fullest possible psychomotor performance and speech re-education.

Keywords:

rehabilitation, psychophysical performance, physical activity, surrogate speech

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Introduction

The incidence of laryngeal cancer accounts for about 2% of all malignant cancers in Poland. Despite the decrease compared to the 1980s and 1990s, about 2,400 new cases are reported each year, of which ca. 75% end in death [1]. The highest incidence rates are observed in the Silesian, Lower Silesian, and Mazowieckie Voivodeships, whereas the lowest - in southern-eastern Poland [2].

Total laryngectomy is performed in patients with advanced laryngeal cancer. It involves the removal of the entire larynx, often with simultaneous amputation of other tissues. Furthermore, a tracheostomy is necessary, which means that after the procedure, breathing will be done without the use of the mouth, nose, and throat. Many difficulties related to fitness and physical functioning also occur [3].

Laryngeal resection is a destructive treatment that changes the appearance and functions of the body. Furthermore, radiotherapy, used as a supplementary treatment, causes xerostomia (dry mouth), edema in the mandibular region, and fibrotic reactions [4].

In addition to surgery, radiotherapy, and chemotherapy, modern standards of cancer treatment also include physiotherapy. It should be supported by doctors and various specialists [5]. It is an essential element of comprehensive rehabilitation at every stage of treatment. It has a positive effect on the physical and mental health of patients during and after cancer treatment. This also applies to head and neck cancers [6]. It is recommended to introduce rehabilitation already in the preoperative period and immediately after surgery, with the necessity to continue the physical exercise by oncological patients [7]. This allows for a much faster recovery and improving the quality of life. At the same time, the risk of recurrence of the neoplastic process decreases [8]. The intensity of

physiotherapeutic procedures and their conditions depend on the type, location, severity, and extent of cancer. Priorities of the procedures change in each period of treatment. However, physiotherapeutic procedures and exercises should always be subject to medical consultation.

The authors of the present study indicated the value of physiotherapy and physical activity in patients after total laryngectomy as one of the necessary treatments.

Consequences of laryngectomy

Patients suffering from laryngeal cancer typically undergo surgeries consisting in the removal of the larynx, radiotherapy, and often chemotherapy, resulting in mutilation, impairment of function, and pain. The consequence of such procedures is impaired function of the entire body, especially the locomotor, respiratory, circulatory and digestive systems, and deterioration of the communication abilities.

Locomotor system

Radical removal of the larynx deteriorates the motor function of the cervical region of the spine, shoulder girdle, and temporomandibular joints. During the surgery, the accessory nerve may be damaged, interfering with the function of the trapezius muscle (head and shoulder girdle movements). The removal of the muscles in the front part of the neck leads to impaired neck mobility (difficulties in performing a nod of the head). Muscle tension imbalance is also observed between the tonic and phasic muscles due to stronger extensor muscles. Gradually, the postural disorder occurs, the head extends forward, whereas the shoulder blades and shoulder line become asymmetrical. The consequences are overload and degenerative changes in the spine and shoulder girdle [9]. The removal of the larynx prevents the formation of intracranial pressure, thus making spinal stabilization more difficult. Furthermore,

the scars formed in the neck of the operated patients may significantly impair the mobility and facial expressions [10].

Respiratory and circulatory system

The removal of the larynx and the inserted stoma modify breathing patterns. The inhaled air is no longer humidified, heated, and filtered from dirt. At the same time, the respiratory function is impaired, maximum lung ventilation and ventilation reserve are reduced [11]. These deficiencies significantly reduce respiratory performance. In the cardiovascular system, a decrease in the cardiac output and stroke volume and an increase in heart rate are observed both during exercise and at rest.

Gastrointestinal tract

People after total laryngectomy may have narrowed and irregular shape of the throat, abnormal peristalsis of its walls, and recesses in the throat causing swallowing disorders. Dysphagia occurs in people with advanced cancers, after radiotherapy, when the body is devastated and weakened. The need to extend the surgery with the root of the tongue increases the difficulty of swallowing because the mobility of the tongue is additionally restricted, the tension of tissues in the neck area increases and the throat becomes narrower. Furthermore, such patients more often report the sensation of dry mouth and throat and the need to change their diets [11]. Furthermore, they often complain about taste, smell, and hearing impairments.

Communication problems

An important problem after the removal of the larynx is the inability to talk. Patients are unable to use laryngeal speech. This leads to environmental isolation and can also cause emotional disorders, anxiety, and depression. The strategy of the speech therapy procedures is critical, consisting in choosing one of three methods: natural, unnatural (prosthetic), or alternative. The natural

method consists in learning speech using preserved or reconstructed or transplanted organs, without using an artificial body. In the prosthetic method, foreign bodies are used such as vocal prostheses or laryngophones. A prosthesis, termed tracheoesophageal fistula, allows for using the so-called fistula speech. A laryngophone is a device that produces a vibroacoustic wave that is modulated and articulated after passing the mouth cavity and then leaves it as understandable words. The alternative method is used when it is impossible to produce a voice using esophageal speech, there are contraindications for the implantation of a voice prosthesis or when using laryngophone fails to produce satisfactory outcomes. The patient might use other skills such as writing, emoticons, gestures, and sign language [12,13].

Other problems

Patients often complain about taste, smell, and hearing impairments. Furthermore, they lose the ability to laugh, scream or cry loudly. It is difficult for them to push during defecation. Laryngectomized patients lose their ability to dive and swim freely (they have to use special swimming equipment).

Physiotherapy objectives in patients with laryngeal cancer

The main goal of physiotherapy in patients with laryngeal cancer is to prevent complications and functional disorders. It is necessary to cooperate with the physiotherapist as early as possible, preferably already in the preoperative period. The overriding goal is to reduce the recovery period. Participation in physiotherapy classes and various forms of physical activity in all periods of the therapy reduces depression and fatigue and has a positive effect on the quality of life [14]. The use of physiotherapeutic procedures, their frequency and duration depend on the type and extent of the

tumor, its location, the severity of the disease, and the course of surgery. The procedures should be individualized, taking into account accompanying diseases and the patient's involitional processes. Furthermore, the level of functional and mental performance of each patient is different and often changes. This also applies to the attitude towards the treatment process. Close cooperation of the physiotherapist during therapies with other members of rehabilitation teams is essential.

Physiotherapy in patients with laryngeal cancer

Objectives and tasks for physiotherapeutic procedures are defined based on the interview, review of documentation, clinical examination, and medical consultation of the patient. Next, the physiotherapeutic methods and techniques that are the most beneficial for the patient are implemented and applied. It is necessary to monitor the patient's progress and to make the necessary adjustments to therapeutic management. There is a tendency to shorten the hospital stay of people after surgical procedures as much as possible.

The physiotherapeutic procedure is basically divided into four periods: preoperative, postoperative hospital, postoperative inpatient, and late postoperative period. Physiotherapy in the hospital in the early period after the laryngectomy usually takes 14 days. When radiotherapy is used, the initiation of physiotherapy procedures is postponed by 7 days [15]. About 7 days after the procedure the seams are removed. This period should be treated as early hospital physiotherapy. Following the patient's discharge from the hospital, a period of postoperative inpatient physiotherapy begins, taking place at home and/or in outpatient settings. The physiotherapist should organize the sessions to match

them to health priorities discussed with the patient. The most frequent indications are a pain in the operated area and outside this area, perceived contracture of the neck tissues (scars) and shoulder girdle, and lymphatic edema in the neck and mandible.

The tasks related to the procedure concern three areas:

1. Treatment of complications and functional disorders:
 - learning to cough,
 - maintaining or improving respiratory performance by enhanced work of the diaphragm and chest muscles and maintaining thoracic mobility,
 - cooperation during speech re-education.
2. Prevention of postoperative complications:
 - pain limitation,
 - early mobilizing and verticalization,
 - preventing venous stasis and pulmonary and thrombotic complications,
 - maintaining the lower limb muscle pump.
3. Recovery of previous psychophysical fitness:
 - maintaining full mobility of the spine and limbs,
 - maintaining muscle strength and neuromuscular conduction,
 - improvement of body posture and general fitness. [16].

Conducting classes and the patient's stay in a hospital, outpatient clinic or home must take place in a favorable environment. Air should be heated and clean, with humidity of ca. 60%.

The scope of the procedures used in individual periods and the aim of the therapy are presented in Table 1.

Table 1. Physiotherapy in the treatment of patients after total laryngectomy

Period	Therapy	Purpose of therapy
preoperative	learning the correct technique of diaphragmatic breathing	increase in respiratory reserve; reduction of loads on the neck; speech re-education after surgery
	breathing exercises performed in various positions	maintaining mobility and muscular strength, especially of the cervical segment, shoulder girdle and torso
	choke out exercises and education of effective cough	prevention of postoperative respiratory complications
	anti-clotting exercises	prevention of postoperative circulatory complications
postoperative hospital	positions of the lying patient	improving lung ventilation; prevention of contractures
	tapping the patient	improving lung ventilation
	kinesitherapy: breathing exercises, improving effective cough and passive and active-passive exercises	maintaining organ fitness; speech re-education
	deep neck and torso muscle activation	stabilization of the cervical spine; torso stabilization; body posture correction
	learning how to change position from lying to sitting and vice versa (holding the back of the head, shoulder rotation)	protection of the operated area; reduction of biomechanical overload of the upper body
	mimic exercises for the face and muscles responsible for temporomandibular joint mobility	maintenance / re-education of muscle performance
	language mobilization and glossopharyngeal nerve neuromobilization	preventing difficulties during eating meals
	patient's verticalization, general rehabilitation exercises in various starting positions	patient's verticalization, general fitness exercises in various starting positions
	relaxing and breathing exercises, creating muscle synergists	pain reduction, recovery of damaged muscles and/or nerves
	lymphatic drainage	improving circulation at the surgery site
stretching the cicatrix (13-14 day)	elasticity cicatrix postoperative and post radiotherapy	

Table 1. Cont.

Period	Therapy	Purpose of therapy
postoperative hospital	ointment lubrications	acceleration of wound healing; making the cicatrix more elastic
	manual massage of the shoulder girdle and neck	loosening tense muscle; improving circulation; stress reduction
	manual face massage	improving muscle work
	implementation of ergonomic principles	correct execution everyday work
	"conversation" with the patient	cooperation with a speech therapist
postoperative post hospital	myofascial relaxation	achieving soft final resistance when moving the scar and surrounding tissues; releasing the scar from "sticking" to deeper tissues; alignment of scar outlines that are drawn into deeper tissues; stretching the scar so that it does not obstruct the head's range of movement in all planes; reduction of pain in the operated area
	breathing exercises	improving performance
	general fitness exercises	improving/maintaining the efficiency of the musculoskeletal system
	facial muscle exercises	improving mimic muscles performance
	gradual introduction of other forms of physical activity	improving/maintaining body function
late postoperative	breathing exercises	improving lung capacity; speech re-education
	general fitness exercises with intensity adjustment to health conditions	improving the efficiency of the musculoskeletal and circulatory system
	postural and elongation exercises	correction / maintenance of correct body posture
	recreational activities: walking, cycling, swimming, playing and games; daily activities related to household chores and activities; professional work	improving psychophysical fitness; improving the quality of life

After the end of the early postoperative hospital period, the patient should be familiarized with the principles of maintaining correct body posture (postural education/re-education) and achieve nearly full range of mobility. The everyday activity should not be difficult for the patient. In the late postoperative period, several forms of physical training and recreation can be used to restore general fitness and physical performance. The variety of proposed exercises and their intensity allow for the adaptation of the patient or the therapy to the individual abilities of each patient. With adequate training, the patient can perform the recommended exercises on their own, while maintaining complete safety.

When recommending patients after total laryngectomy for exercise and physical activity sessions, acute and chronic states that affect physical activity should be taken into account, including ataxia, anemia, and restriction of the range of movement caused by procedures and complementary therapies

(chemotherapy, radiotherapy). The use of immunosuppressive drugs also represents a potential risk.

Properly conducted physiotherapy helps reduce pain and sensory disorders, improves the performance of the muscular and nervous system and reduces anxiety. The above-mentioned elements of therapy have an impact on the achievement of the main goal of treating patients after total laryngectomy, which is to achieve the fullest possible psychomotor performance and speech re-education. The therapy program is always individual.

Physiotherapists should not only improve and care for the restoration of the functional status but also perform a psychoeducational role. This concerns especially the group of patients in whom a full recovery is impossible. However, everyday work with conscious full participation of the patient in the treatment ensures the patient's safety and return to optimal fitness in the shortest possible time.

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