



KEY ASPECTS IN LARYNGOLOGICAL CARE OF PATIENTS AFTER LARYNGECTOMY WITH RECURRENCE OF LARYNGEAL CANCER

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Introduction: The larynx is the most common location of malignant tumors of the head and neck region. Approx. 90% of malignant tumors of the larynx are squamous cell carcinomas. The patient after treatment for laryngeal cancer has problems with the basic functions of life, i.e. breathing, eating, speaking, disorders of smell and taste and also the sense of aesthetics of their own body. Therefore, caring for a laryngectomized patient requires a multidisciplinary approach. Every patient undergoing laryngectomy undergoes a process of social rehabilitation, both in terms of family, work and community life.

Purpose: The purpose of this article was to present current knowledge on the care of patients with recurrent laryngeal cancer, detailing the role of individual members of the multidisciplinary team

Methods: A review of current medical knowledge.

Discussion and conclusions: A patient who successfully completed treatment for laryngeal cancer requires the care of a team of doctors from different specialties. In addition to an oncologist, laryngologist, internist, family medicine doctor and palliative care physician, a psychologist plays a significant role in the treatment process.

Keywords: laryngeal cancer, palliative care, rehabilitation, head and neck cancer, tracheotomy

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INTRODUCTION

The larynx is the most common location of malignant tumors of the head and neck region [16]. Cancer of the larynx is classified as a tobacco-dependent cancer, which has been proven in studies showing a linear association of cigarette smoking with an increase in the risk of developing a malignant lesion by about 10-15 times relative to the non-smoking population. In addition to tobacco, exposure to various agents, i.e., human papilloma virus (HPV), alcohol, wood dust, coal distillation products, paints and solvents, has a very significant impact on the incidence of cancer in this region [1].

In Poland, cancer of the larynx and pharynx accounts for 4% of all cancers in men and 0.5% of cancers in women [7]. Due to the anatomical structure of the larynx and its close proximity to the lower pharynx, the spectrum of symptoms presented by the patient varies greatly and largely depends on the location of the primary lesion and the direction of spread of the neoplastic process [11]. Malignant tumors of the upper level of the larynx – the supraglottis – are characterized by fairly rapid growth, a feeling of obstruction when swallowing, radiating pain to the palatine tonsil or ear and early metastasis to the lymph nodes of the neck. Therefore, often the first symptom reported by the patient is the appearance of an enlarged lymph node in the neck. In contrast, cancers of the middle level of the larynx – the glottis – are usually characterized by slow local growth, and metastasis to lymph nodes is rare, due to the small lymphatic vascularization of this area. The first symptom here is hoarseness, voice change, laryngeal wheezing and shortness of breath. Cancers of the lower laryngeal level – the subglottis – have moderately dynamic local growth and more frequent metastasis to lymph nodes, not only of the neck, but also of the chest (mediastinum), than in glottis cancer. Symptoms of subglottic carcinoma are initially discrete and clearly appear when the airway is narrowed (wheezing, shortness of breath) and the glottis is taken over or the recurrent laryngeal nerve is paralyzed (hoarseness).

Due to low public awareness of laryngeal cancer, difficulties in accessing specialists, and the significant prevalence of smoking, about 64% of patients with laryngeal cancer begin oncological diagnosis while already at clinical stage III or IV of cancer. The appearance of regional lymph node metastases worsens a patient's prognosis, reducing the chances of distant survival by up to 50%.

Laryngeal cancer is among the cancers that have seen a decline in 5-year patient survival rates over the past 40 years. It is currently estimated at 63% [15], and for high tumor stage, survival drops to 43% in T3 tumors and 30% in T4 tumors. It should be noted that the most common relapse occurs within 2 years after the end of treatment. Among patients with recurrence of the cancer process in the larynx, most do not survive another 2 years [2].

The results of laryngeal cancer treatment, as well as patients' subsequent quality of life after therapy, are largely dependent on the initial stage of the disease. Early diagnosis in many cases allows almost complete preservation of the organ's function and the patient's return to a normal life like before the disease.

However, the majority of patients who start treatment at clinical stage III or IV require combined treatment, i.e. surgery with complementary radiotherapy and sometimes chemotherapy, which carries a high risk of complications.

The purpose of this article is to present current knowledge on the care of laryngectomized patients with recurrent laryngeal cancer, detailing post-treatment complications and the role of individual members of the interdisciplinary team.

Complications of laryngeal cancer treatment

Complications associated with laryngeal cancer therapy depend on the type of treatment implemented, its scope, the location of the tumor and its extent. These should be distinguished from the planned consequences of treatment resulting from laryngectomy, i.e. loss of the organ responsible for phonation and breathing. Complications of laryngeal tumor treatment can be divided into 2 groups [19]:

- A. Complications after surgical treatment:
 - esophageal-skin fistulas [8],
 - granulation, inflammation in the tracheostomy area,
 - esophageal strictures,
 - abnormal healing resulting in tissue necrosis.
- B. Complications after radiotherapy treatment with/without chemotherapy:
 - radiation-induced skin lesions,
 - radiation-induced tissue necrosis,
 - general weakness of the body,
 - damage to internal organs after chemotherapy.

The role of individual specialists in the management of complications after laryngeal cancer treatment

The aforementioned complications require a long and arduous treatment process led by a multidisciplinary team. In cases where the patient has advanced, inoperable recurrence of the cancer process, we are left with only palliative treatment, aimed at giving the patient the best possible quality of life.

The palliative treatment team for patients with laryngeal cancer should include an oncologist, an ENT specialist, an internist, a family medicine and palliative care physician, a psychologist, a psychiatrist and a speech therapist.

A. The role of the palliative and family medicine physician.

The palliative and family medicine physician plays a leading role during the long-term care of the patient. The following are their responsibilities:

- controlling biochemical parameters and correcting them accordingly,
- pain treatment (often after consultation with a pain clinic),
- treatment of additional conditions,
- conducting adequate nutrition especially when the patient is receiving food through a gastric tube or is fed parenterally,
- commissioning consultations of other specialists.

B. The role of the laryngologist.

The laryngologist also plays a key role in the treatment process. They are responsible for ensuring the patency of the airway, healing the surgical wound, providing a feeding route and the patient's ability to communicate with the outside world.

Ensuring airway patency

Airway patency after laryngectomy is maintained with the creation of a permanent tracheostomy. Particularly during the first weeks after the operation, tracheostomas require the laryngologist to regularly check and evaluate the initial trachea and main bronchi. The accumulation of secretions in the tracheal orifice, followed by its drying up, leads to a reduction of the airway lumen, making it difficult for the patient to breathe. Daily assessment and toilet of the bronchial tree performed initially by the doctor and then by the patient themselves reduces the risk of airway obstruction.

Tracheostomy tubes are used to ensure airway patency and prevent tracheostomy stenosis. These tubes can irritate or compress the tracheal lumen, resulting in a wound that tends to granulate, bleed, and sometimes form ulcers and fistulas in the tracheal wall or secondary scarring and narrowing of the airway. Proper fiberoptic inspection of the trachea and bronchial tree can detect abnormalities in the healing process and prevent further development of complications.

We can group tracheostomy tubes by the material they are made of into:

1. Metal tubes (Figure 1) – made of surgical steel, rendering them sterilizable and reusable, which makes financial sense for the patient. They come in two versions – with an additional internal cannula that can be easily replaced and cleaned by the patient, or without one. Metal tubes are being used less and less due to their rigidity. However, some patients cannot tolerate cannulas made of plastic. In these situations, metal tubing works very well. In addition, when the tracheostomy narrows, such a tube can be used to widen the tracheostomy opening by gradually stretching it, with an increasingly larger metal tube. These tubes should be replaced with plastic ones when the patient undergoes radiation therapy.



Fig. 1. Metal tracheotomy tube.

2. Plastic tubes – much more popular because of the comfort of their use. Similar to metal tubes, they come in one-piece or two-piece versions. The two-piece tubing consists of an outer cannula with a flange, as well as a re-

movable inner cannula, which facilitates the tubing cleaning process. The patient themselves pulls out the inner part of the tube for toileting and, by leaving the outer part in place, is not worried about problems with maintaining airway patency. The tube can be equipped with a sealing cuff (balloon) and fenestration holes. The sealing balloon can be used to protect against aspiration of blood or stomach contents into the airway in cases of bleeding from the tracheostomy area, the presence of an esophageal-tracheal fistula, and in patients after partial laryngectomies with a tendency to choke. However, it should be noted that a long-inflated balloon causes pressure and sores in the tracheal wall. Phoniatric tubes, which contain fenestration holes, allow patients with a partially preserved larynx or with an implanted voice prosthesis after a total laryngectomy to speak.

When using tracheostomy tubes, be aware of the need for heat and moisture exchangers. Removal of the larynx cuts off the connection between the lower and upper airways. In a healthy person, the upper respiratory tract has a cleansing, warming and humidifying function for the air inhaled by a person. If this connection is removed, air is directly inhaled into the lungs, which can exacerbate mucosal drying, scabbing and increase the risk of developing infections. Heat and moisture exchangers act as artificial noses. In addition, the filters prevent contaminants from entering the patient's airways. The exchangers can be attached directly to the tracheotomy tube or fixed above the tracheostomy using specially dedicated patches. Due to their design, they can be gently nudged, allowing the patient to use the voice prosthesis and communicate with the outside world.

The selection of a tracheostomy tube should be primarily guided by individual patient indications. Some people are intolerant of silicone tubing, while others are just the opposite. The same situation applies to patches. Depending on the adhesive or plastic used to make them, they can cause allergic reactions and skin irritation in patients. It is also important to remember to instruct the patient on the importance of maintaining adequate humidity (about 60%) in the rooms where they are staying and the need to check the temperature of food. Not being able to draw in air at the same time as drinking and eating, increases the risk of burning the mouth or esophagus.

Postoperative wound healing

Another role of an laryngologist in the care of a laryngectomized patient is to inspect the postoperative wound. It is especially important in cases of fistula [13] and necrotic lesions (Figures 2, 3). It should be noted that when such complications arise, especially when they are the result of a recurrence of the cancer process, there is a significant deterioration in the quality of life of the patient and their loved ones. Necrotic skin lesions, especially extensive ones, lead to tissue breakdown, which is always associated with the risk of bacterial infection and a fetor coming out of the wound. Therefore, proper dressing changes, care of tissue defects or fistulas are so important. In the care of such complications, daily flushing of these areas with preparations containing superoxide radicals acting as oxidants, or polyhexanidine and betaine (Microdacin, Prontosan), works very well [14]. They support autolytic cleansing of the wound from necrosis and create an appropriate healing environment. These drugs destroy microorganisms and inhibit their growth. They penetrate well the biofilm, a layer of bacteria that impedes wound healing. At the same time, they do not show cytotoxic, sensitizing or irritating effects. The formulations come in both liquid and gel forms. The gel substance can be left under the dressing overnight. A good complement to the therapy are dressings with silver ions left on around the clock, which have an antibacterial effect. They additionally contain substances that eliminate the surface tension of the biofilm (such as EDTA and BEC) and make it easier for silver ions to penetrate and destroy the bacterial cell. In the case of bacterial superinfection, there is a need for local or sometimes general antibiotic therapy.



Fig. 2. Radiation necrosis of the skin of the tracheostomy area



Fig. 3. Esophageal-cutaneous fistula.

One of the wound healing complications that can arise after laryngectomy is pharyngeal-cutaneous or esophageal-cutaneous fistulas [10]. They are the connection between the lumen of the digestive tract and the skin of the neck, through which saliva escapes. They most often form in the area of the neck incision and, based on the time of formation, can be divided into early – a complication of the postoperative healing process, and late – which are most often associated with the recurrence of the cancer process or evidence of non-radical surgery.

In palliative patients, the process of treating such a fistula can be very lengthy and requires a great deal of commitment on the part of the treating physician [12]. Incorrect therapy can result in a deterioration of the patient's general condition, an increase in nutritional deficits and even pose an immediate threat to the patient's life. In the case of the initial stage of fistula formation, treatment is based on conservative treatment in the form of: daily dressing changes, antibiotic therapy based on cultures taken from the fistula, and feeding through a gastric probe. In the absence of improvement despite the above-mentioned treatment, the next solution that should be implemented is surgical fistula repair consisting of refreshing the wound edges and directly suturing them, or using reconstructive surgery of the lower pharynx and esophagus with skin flaps.

Sometimes hard-to-heal wounds require supportive treatment with Vacuum Assisted Closure (VAC) therapy. Vacuum therapy allows for better functional results and significantly reduces the time needed for wound healing. Treatment consists of applying negative pressure continuously or intermittently to the wound and its surrounding area. VAC therapy dressings are made of a special sponge fitted and placed precisely in the wound, covered with a transparent covering. A pump that generates negative pressure is connected to the

dressing, which causes suction and collection of fluid accumulating in the wound, and the sponge inside gradually reduces its volume by up to 80%. Dressings are usually changed every 24-36 hours. By removing excess fluid from the wound, VAC, reduces swelling and helps fight bacterial colonization, improves the natural granulation process by changing the biochemistry of the wound (the vascular endothelial growth factor, fibroblast growth factor and collagen levels are raised). In addition, the device increases blood supply to the wound by improving blood flow in the wound area.

Patients with late fistulas should always undergo a thorough oncological diagnosis to rule out tumor recurrence before starting surgical treatment.

Providing a feeding route

Initially, feeding a laryngectomy patient is usually done through a gastric probe. Note that a probe fixed in the nasal passage is a source of considerable discomfort for the patient, and can lead to ulceration and necrotic lesions in the nasal wing. In cases where insertion of a probe is not possible (e.g., massive throat tumors), parenteral nutrition or gastrostomy should be considered.

A good solution that should be considered is to place a PEG, or percutaneous endoscopic gastrostomy, in the patient. It is an artificial access route into the stomach created for the purpose of enteral feeding. Under general anesthesia, a 15-28 Cha/F silicone or polyurethane drain is inserted into the stomach under endoscope guidance. The prerequisite for carrying out this procedure is that the patient's condition is stable, there are no contraindications to the endoscopic procedure and the esophagus is unobstructed.

Improving smell and taste functions

It is also worth noting the function of smell and taste after laryngectomy [6]. The organ of smell is located in the upper part of the nasal cavity and is not damaged when the larynx is completely removed, but the change in the airflow path during breathing (with the elimination of the nasal cavity) greatly impedes the delivery of odor stimuli to the olfactory receptors. This in the long term can secondarily lead to atrophy of the olfactory epithelium, which is not stimulated [5]. Therefore, olfactory training becomes an important issue in the care of a laryngectomized patient. Noticing and perception of odors improves with mastery of esophageal speech. The patient should also perform special exercises to increase the perception of olfactory stimuli – forcing air into the nasal cavity. They consist of:

- inhaling air into the mouth, as we do before speaking,
- provoking a belch,
- closing the mouth so that the air with the scent goes to the area of the olfactory field in the nasal cavity.

Lack of smell results in deterioration of taste. The patient distinguishes basic tastes, but loses the pleasure of tasting food. In the early stages after radiation therapy, taste sensations may be further impaired by impaired saliva secretion, dryness in the mouth and inflammation in the area. However, after a few weeks after surgery and the end of radiation therapy, taste sensation usually improves and sometimes returns to normal. Until then, patients should be advised to do taste training and eat foods with intense flavors and distinctive textures to stimulate additional senses, i.e. touch, hearing or vision, which enhances the taste experience [9].

Ensuring the ability to communicate

During the laryngectomy procedure, the patient is deprived of one of their basic social activities – the ability to communicate verbally, that is, to communicate using the voice. It is important to present the patient with all the options for voice rehabilitation. Learning to speak in a new way is a long process that requires a lot of patience, especially in the first post-operative period. Difficulties in communication are often the cause of the patient's impatience, discouragement and feelings of helplessness, significantly reducing their quality of life.

In the process of voice and speech rehabilitation, we use the esophagus, the upper section of which, called the "mouth" or "upper sphincter," takes over the role of the glottis (the so-called "pseudo-glottis" is formed). The esophagus becomes the air reservoir in place of the trachea. Air removed by an antiperistaltic motion (belching) vibrates the pseudo-glottis, creating sound. This is a process that requires training, and for some patients, despite their efforts, producing speech that is understood by those around them becomes impossible. Loud belching is generally considered rude, however, in rehabilitation it is essential for voice formation and esophageal speech. It is also very important to master the conscious, controlled diaphragmatic breathing necessary for learning esophageal speech.

Currently, the gold standard for voice rehabilitation is the insertion of a voice prosthesis [18], placed in the esophageal-tracheal fistula created during laryngectomy. Practically immediately af-

ter the procedure patients begin to speak simple words and build sentences. After leaving the hospital, speech training should be continued under the supervision of a speech therapist, with the aim of preventing the formation and consolidation of abnormal habits that hinder later functioning. Patients who fail to master esophageal speech speak in a pseudo-whisper and have great difficulty communicating with those around them. They also sometimes communicate with their surroundings nonverbally (e.g., through gestures, lip movements) or by writing, but this reduces both the speed and quality of communication [20].

In some patients who have difficulty mastering replacement speech, speech support with the so-called electronic laryngophone is used. The device in its early days was far from perfect – although it emitted sounds, they were very distorted, resembling more of a whirr than natural human speech, and the intelligibility of messages of this type was estimated at 60%. Later improvements and newer versions of the artificial larynx have made it possible to significantly reduce noise and improve the sound created.

DISCUSSION AND CONCLUSIONS

A patient who requires palliative treatment for a recurrence of the cancer process is most often a patient in great physical and mental pain, with full awareness of the disease. Such a patient is well aware of the state of their health, which is steadily deteriorating. In addition, discomfort related to the most important vital functions, i.e., disruption of speech, breathing, eating, and, above all, the aesthetic aspect resulting from post-operative deformities, or those resulting from the disease itself, lead to physical as well as psychological suffering. The cause of almost all the consequences of laryngectomy of a psychological and social nature are changes of a somatic nature [4]. Mental discomfort and a lowered sense of purpose in life can progress to depression or despondency and even lead to suicide attempts. It has been proven that the level of depression is higher in those who have undergone total laryngectomy relative to those who have undergone partial laryngectomy [3,17]. It was also noted that laryngectomy patients were less likely to succumb to depressive reactions than patients after surgical treatment of other tumors in the head and neck.

Interestingly, laryngeal cancer may have a greater impact on women's psychological functioning than men's, as the female gender is more likely to have concerns about aesthetic defects, as

well as a sense of loss of femininity as a result of using surrogate speech. At the same time, it is noticeable that women cope better than men with the consequences of laryngectomy, provided they have strong family support.

That is why it is so important that the patient be taken care of by a team of doctors from different specialties. In addition to oncologists, laryngologists, internists, family and palliative medicine

physicians, and speech therapists, psychologists and psychiatrists play a significant role in the treatment process. It is up to them to develop a positive approach to the disease and the entire treatment process, to give both the patient and their loved ones adequate support so that the patient can pass through this last stage of life with dignity and as little trauma as possible.

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REFERENCES

- Allegra E, Bianco MR, Ralli M, Greco A, Angeletti D, de Vincentiis M. Role of clinical-demographic data in survival rates of advanced laryngeal cancer. In *Medicina (Lithuania)*. 2021; 57(3). doi: 10.3390/medicina57030267.
- Ampil FL, Ann C, Nathan O, Caldito G, Lian TF, Aarstad RF, Murty Krishnamsetty R. Total Laryngectomy and Postoperative Radiotherapy for T4 Laryngeal Cancer: A 14-Year Review, 2004. doi: 10.1053/j.amjoto.2003.11.004.
- Bussian C, Wollbrück D, Danker H, Herrmann E, Thiele A, Dietz A, Schwarz R. Mental health after laryngectomy and partial laryngectomy: A comparative study. *European Archives of Oto-Rhino-Laryngology*. 2010; 267(2): 261-266. doi: 10.1007/s00405-009-1068-7.
- Cieślak K, Golusiński W, Wegner A, Zagozda M, Kuśnierkiewicz M. Psychospołeczne konsekwencje laryngektomii. Psychosocial consequences of laryngectomy. In *Otorynolaryngologia*, 2017.
- Gürbüz D, Kesimli MC, Bilgili AM, Durmaz HÖ. Olfactory rehabilitation and olfactory bulb volume changes in patients after total laryngectomy: a prospective randomized study. *Brazilian Journal of Otorhinolaryngology*. 2022; 88(4): 607-612. doi: 10.1016/j.bjorl.2021.02.013.
- Kesimli MC, Kaya D, Aydemir L, Durmaz HÖ. A simple method for olfactory rehabilitation following total laryngectomy. *European Archives of Oto-Rhino-Laryngology*. 2021; 278(12): 4917-4921. doi: 10.1007/s00405-021-06711-x.
- Kordek R. (red.). *Onkologia, podręcznik dla studentów i lekarzy*. Gdańsk 2013.
- Lemaire E, Schultz P, Vergez S, Debry C, Sarini J, Vairel B, de Bonnacaze G, Takeda-Raguin C, Cabarro B, Dupret-Bories A. Risk Factors for Pharyngocutaneous Fistula After Total Pharyngolaryngectomy. *Ear, Nose and Throat Journal*. 2021; 100(5_suppl): 746S-752S. doi: 10.1177/0145561319901035.
- Longobardi Y, Parrilla C, di Cintio G, de Corso E, Marenda ME, Mari G, Paludetti G, D'Alatri L, Passali GC. Olfactory perception rehabilitation after total laryngectomy (OPRAT): proposal of a new protocol based on training of sensory perception skills. *European Archives of Oto-Rhino-Laryngology*. 2020; 277(7): 2095-2105. doi: 10.1007/s00405-020-05918-8.
- Mueller SA, Dehnbostel S, Dehnbostel F, Giger R. Treatment of tracheoesophageal fistula after laryngectomy by a customized tracheal prosthesis. *Laryngoscope*. 2018; 128(8): 1858-1861. doi: 10.1002/lary.27027.
- Niemczyk K. (red.). *Otolaryngologia kliniczna*, Warszawa 2015.
- Reksodiputro MH, Hutaaruk SM, Widodo DW, Fardizza F, Mutia D. Platelet-Rich Fibrin Enhances Surgical Wound Healing in Total Laryngectomy. *Facial Plastic Surgery*. 2021; 37(3): 325-332. doi: 10.1055/s-0040-1717083.
- Rzepakowska A, Osuch-Wójcikiewicz E, Ochal-Choińska A, Bruźgielewicz A, Chęciński P, Nyckowska J, Szwedowicz P. Pharyngocutaneous fistula as a complication after total laryngectomy – Clinical study and literature review. *Otolaryngologia Polska*. 2011; 65(5 SUPPL.): 22-30. doi: 10.1016/S0030-6657(11)70705-3.

14. Seiser S, Cerbu D, Gallhofer A, Matiasek J, Elbe-Bürger A. Comparative assessment of commercially available wound gels in ex vivo human skin reveals major differences in immune response-modulatory effects. *Scientific Reports*. 2022; 12(1). doi: 10.1038/s41598-022-20997-9.
15. Siegel RL, Miller KD, Fuchs HE, Jemal A. Cancer statistics, 2022. *CA: A Cancer Journal for Clinicians*. 2022; 72(1): 7-33. doi: 10.3322/caac.21708.
16. Steuer CE, El-Deiry M, Parks JR, Higgins KA, Saba NF. An update on larynx cancer. *CA: A Cancer Journal for Clinicians*. 2017; 67(1): 31-50. doi: 10.3322/caac.21386.
17. Studzińska K, Obrębowski A, Wiskirska-Woźnica B, Obrębowska Z. Problemy psychologiczne w rehabilitacji chorych po operacjach całkowitego usunięcia krtani. *Polski Przegląd Otolaryngologiczny*. 2012; 1(2): 124-128. doi: 10.1016/s2084-5308(12)70021-7.
18. Tong JY, Pasick LJ, Benito DA, Sataloff RT. Complications associated with tracheoesophageal voice prostheses from 2010 to 2020: A MAUDE study. *American Journal of Otolaryngology - Head and Neck Medicine and Surgery*. 2020; 41(6). doi: 10.1016/j.amjoto.2020.102652.
19. Vlčková K, Tedla M. Functional Results after the Larynx Preserving Treatment of Laryngeal Cancer; suggestions for the follow-up. *Otolaryngologia Polska*, 2019; 73(3): 1-5. doi: 10.5604/01.3001.0013.2310.
20. Zenga J, Goldsmith T, Bunting G, Deschler DG. State of the art: Rehabilitation of speech and swallowing after total laryngectomy. *Oral Oncology*. 2018; 86: 38-47. doi: 10.1016/j.oraloncology.2018.08.023.

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