Strategies for rehabilitation and outcomes in patients treated with chemoradiotherapy and radiation therapy for head and neck cancer Institutional experience and a systematic review.

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ABSTRACT

Oncologic treatments for head and neck cancer, such as radiotherapy and chemoradiation, can produce long-term impairments in swallowing function (known medically as dysphagia), which can have a significant influence on quality of life. Dysphagia brought on by radiation exposure is characterised by a wide variety of anatomical, mechanical, and neural impairments. The purpose of this study is to gain an understanding of the significance of oncological rehabilitation during radiation therapy and chemoradiation in order to reduce the risk of dysphagia occurring during treatment, which ultimately results in a delay in the total amount of time spent receiving treatment (OTT).

Keywords:

INTRODUCTION

In India, men are more likely to be diagnosed with oral cancer than any other type of cancer (16.1% of all cancers). Oral cancer accounts for 10.4% of all malignancies diagnosed in women in India, making it the country's second most frequent form of the disease [1]. The use of tobacco products is directly responsible for approximately 80–90% of all cases of mouth cancer [2]. The average age of patients diagnosed with oral cancer is 50 years old [3]. Survival rate is (5-years) [4]. Radiation therapy, surgery, and chemotherapy are the three primary treatment modalities that are utilised in the management of head and neck cancer. Radiation therapy, surgery, or a combination of both are the basic treatments; chemotherapy is frequently used as an extra treatment, also known as an adjuvant treatment. It is dependent on the location of the cancer as well as the stage (degree of severity) of the disease to determine which combination of the three treatment methods is best for a patient diagnosed with a certain type of head and neck cancer. Oral cancer accounts for 16.1% of all cases of cancer diagnosed in men in India, making it the country's most prevalent form of the disease. Oral cancer accounts for 10.4% of all cases of cancer in the female population of India, making it the country's second most common form of the disease. Tobacco usage is directly responsible for approximately eighty to

ninety percent of all cases of mouth cancer [2]. The average age at which oral cancer is diagnosed is 50 years. 3 Survival rate is (5-years) [4]. Radiation therapy, surgery, and chemotherapy are the three primary forms of treatment for head and neck cancer management. Radiation therapy, surgery, or a combination of both are the basic therapies. Chemotherapy is frequently employed as an extra treatment, sometimes known as an adjuvant treatment. It is dependent on the location of the cancer as well as the stage (degree of severity) of the disease to determine which combination of the three treatment methods is best for a patient who has been diagnosed with head and neck cancer.

The creation of an excessive synthesis of reactive oxygen and nitrogen species is one of the most deleterious effects of radiation exposure (ROS). An oxidative metabolic activity that occurs within organelles or a source that is enzymatic can be responsible for the production of reactive species under both normal and disease-causing situations. Cell stress and ultimately tissue loss, which are both referred to as oxidative damage, can be caused when there is an imbalance between the antioxidant defences of reactive species and the reactive species themselves [8].

Injury to the skeletal muscles is another one of the negative side effects of radiation therapy. Radiation can cause varying degrees of damage to skeletal muscle depending on the area of the body that is being treated and the kinds of tissues that are being damaged [9–12]

It was previously believed that latent mitotic activity within skeletal muscles made them immune to the effects of radiation [13]. On the other hand, survivors of head and neck cancer frequently experience a functional deterioration, decreased muscle strength, and limited range of movement [14–16]. Patients who have had treatment for head and neck cancer frequently suffer with pharyngeal immobility including impaired bolus movement, which may include impaired bolus movement during swallowing, as well as post-swallow residue in the posterior pharyngeal wall, laryngeal vestibule, and Pyriform sinus [17]

As a consequence of early or late radiation damage, disturbances in the motor and sensory pathways can arise, which can have an effect on the airway [18]. Radiation therapy has the potential to impact the peripheral nerves that are responsible for innervating the swallowing muscles. Radiation therapy has the potential to produce thermal and mechanical damage, which can ultimately set off a cascade of inflammatory mediators in the oral mucosa. These mediators include cytokines, neuropeptides, and glutamate signals [19]. Radiation therapy can lead to a number of unpleasant side effects, the most prevalent of which is oral mucositis. This condition occurs when the epithelium lining of the mouth becomes damaged, resulting in severe pain and suffering. In reaction to nociceptive pain receptors being exposed to oxidative stress, the receptors' membrane potential drops [20]. A neuropathic sensory impairment may be the cause of pain that is unmanageable or continues for an extended period of time [21]

Acute inflammation or trauma to the vocal folds can sometimes induce immune response consequences in the brain stem. Both inflammation and fibrosis have the potential to disrupt the normal electrophysiology of muscles and nerves. Radiation therapy has the potential to cause

changes in sensory inputs such as bolus size and flavour. Radiation therapy has the potential to disrupt the normal initiation and modulation of the coughing and swallowing reflexes. 22 Radiation therapy is associated with a risk of developing long-term complications, one of which is damage to the lower cranial nerves. The most common manifestation of radiation-induced neuropathies in patients with head and neck squamous cell carcinoma is a condition known as bulbar palsy. This occurs due to the proximity of cranial nerves to the radiation field and close proximity to the highly sensitive fibrosis area. Both of these factors contribute to this phenomenon [23] To improve the long-term outcomes of swallowing and to lower the pain sensitivity caused by oral mucositis, our institute began including prophylactic oromotor and swallowing exercises as well as photobiomodulation therapy from the very beginning of chemotherapy treatment.

DISCUSSION

Prophylactic oro motor exercises, swallowing exercises, and pharyngocise can be utilised to increase muscular fatigue resistance. This increase in resistance can be linked to a modification in mitochondrial biogenesis, myofiber strength, and suppression of oxidative stress. [24–26] Because of the quick increase in ROS that occurs during muscular contraction, active skeletal muscles are more likely to engage in high levels of oxidative production. This is because ROS are formed when muscles are contracted [27].

It is essential for the myofibres in the swallowing muscles to possess powerful antioxidant capabilities in order to successfully counteract the ROS that are caused by radiation. All of the patients who participated in the preventative swallowing exercises while they were receiving chemotherapy or radiation therapy had a more normal tongue base and a more normal epiglottic inversion. Patients have fewer anatomical alterations in the muscles of the genioglossus, hypoglossus, and mylohyoid. Pharyngocise, more often known as yawning, assists in the upward migration of the larynx as well as the opening of the oesophagus. The movement of the tongue base and pharynx can be improved by practising pharyngocise, often known as an effortful swallow. The Medelsohn's procedure, also known as the pharyngocise, encourages movement of the epiglottis, which in turn enhances the function of the larynx and the strength of the opening to the oesophagus. Strengthening the tongue muscles using the Maskao Manouever (Pharyngocise) is beneficial for swallowing. Control of the epiglottis (Pharyngocise) helps to improve the protection of the airway during swallowing. The Shakers manoeuvre, also known as the Pharyngocise, helps to enhance the opening of the oesophagus and promotes the movement of the epiglottis. It encourages the larynx to shift upwards as a result of this. Pharyngocise, also known as resistive tongue exercises, enhances both the power of the tongue as well as one's ability to manage food and drink [28].

CONCLUSION

It has been hypothesised that the mechanism of photobiomodulation is an activation of the production of energy by cytochromes located in the mitochondria of oral mucosa cells. This activation would take place through the transfer of electrons [29]. The process of photobiomodulation encourages the rapid regeneration of myofibroblasts that originate in fibroblasts. The growth factors produced by these

fibroblasts maintain repair and cytotoxic protection [30].

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