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REVIEW ARTICLE

EFFECT OF RADIATION THERAPY IN CONJUNCTION WITH CHEMOTHERAPY ON NECK AND SHOULDER MUSCLES IN HEAD AND NECK CANCER PATIENTS: A PILOT STUDY

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ABSTRACT

Background: Head and neck cancer are emerging as a major health problem. The management of head and neck cancers involves a variety of options like surgery, radiation therapy, chemotherapy or targeted/immunotherapy & palliative care. Radiation Therapy is the most common form of treatment in operated as well as non- operated cases. The various side effects of radiation therapy involve xerostomia, fatigue, skin changes/reactions, dysphagia, damage to the nerve, muscle, tendons and ligaments which causes conditions like dropped neck syndrome, muscle atrophy, etc. The aim of the study was to find the effect of radiation therapy in conjunction with chemotherapy on neck and shoulder muscles in head and neck cancer patients. **Methods:** It was a pilot study & 4 samples were taken. Range of Motion & Manual Muscle Testing were administered on patients and the result were analysed. **Results:** The study found that there was an incidence of neck muscle weakness among patients receiving radiation therapy with chemotherapy for head and neck cancer with the mean of Grade 4 of Manual Muscle Testing. Also, there was incidence of shoulder muscle weakness in one of the patients with the mean of 4.75. Due to a smaller number of subjects, the effect of on shoulder muscles couldn't be clearly found out. **Conclusion:** The study concluded that there is an effect of radiation therapyin conjunctionwith chemotherapy on both neck and shoulder muscles in head and neck cancer patients. Thus, physiotherapy intervention is necessary to maintain the mobility & strength of neck and shoulder in such patients.

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INTRODUCTION

Head and neck cancer is a group of cancers that starts in the mouth, nose, throat, larynx, sinuses, or salivary glands. Symptoms for head and neck cancer may include a lump/ulcer that does not heal, a sore throat that does not go away, dysphagia, or dysphonia. According to a study conducted by WHO& International Agency for Research on Cancer the incidence of esophagus was found to be 3.2% globally. Together, they are the seventh most frequent cancer and the ninth-most-frequent cause of death from cancer. In Asia, it was found to be 77.7% of all cancers. According to a study by Manik Rao Kulkarni, Head and Neck cancers in India accounted for 30% of all cancers. In India, 60 to 80% of patients present with advanced disease as compared to 40% in developed countries.

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Head and neck cancer management is complex due to its multiple sites, stages and histologies. The intent of treatment can be defined as one of the following: curative, anti-cancer therapy to improve quality of life and/or longevity without expectation of cure, or symptom palliation. The management of head and neck cancers involves a variety of options like surgery, radiation therapy, chemotherapy or targeted immunotherapy& palliative care. Radiation therapy is the most common form of treatment. There are different forms of radiation therapy, including 3D Conformal radiation therapy, Intensity-modulated Radiation Therapy (IMRT) Image-guided Radiation Therapy (IGRT), Particle beam therapy and brachytherapy, which are commonly used in the treatments of cancers of the head and neck. The goal of the radiation is to kill rapidly dividing cancer cells while sparing slower dividing somatic cells. The various side-effects of radiation therapy to head and neck involve: Xerostomia and thick saliva, fatigue, taste changes, dysphagia, skin changes or reactions, jaw problems, hearing problems, blood vessel changes and

secondary cancers. Other problems include damage to the nerve, muscle, tendons and ligaments, dropped neck syndrome, etc. Neck and shoulder muscle weakness is also one of the major side-effects of radiation therapy and needs to be considered.

Aims and Objectives: The aim of the study is to find the effect of radiation therapy in conjunction with chemotherapy on neck and shoulder muscles in head and neck cancer patients.

MATERIAL AND METHODOLOGY

- Study Design: Pilot Study.
- Study Setting: Oncology Department, Dr. Vitthalrao Vikhe Patil Memorial Hospital, Ahmednagar.
- Study Duration: 6 Months.
- Sample Size: 4 samples.
- Sampling Method: Purposive Sampling
- Inclusion Criteria: Patients who have received radiation therapy or chemotherapy for head and neck cancer.
- Exclusion Criteria: Patients who are already diagnosed with neuromuscular problems of neck or shoulder.

Procedure:

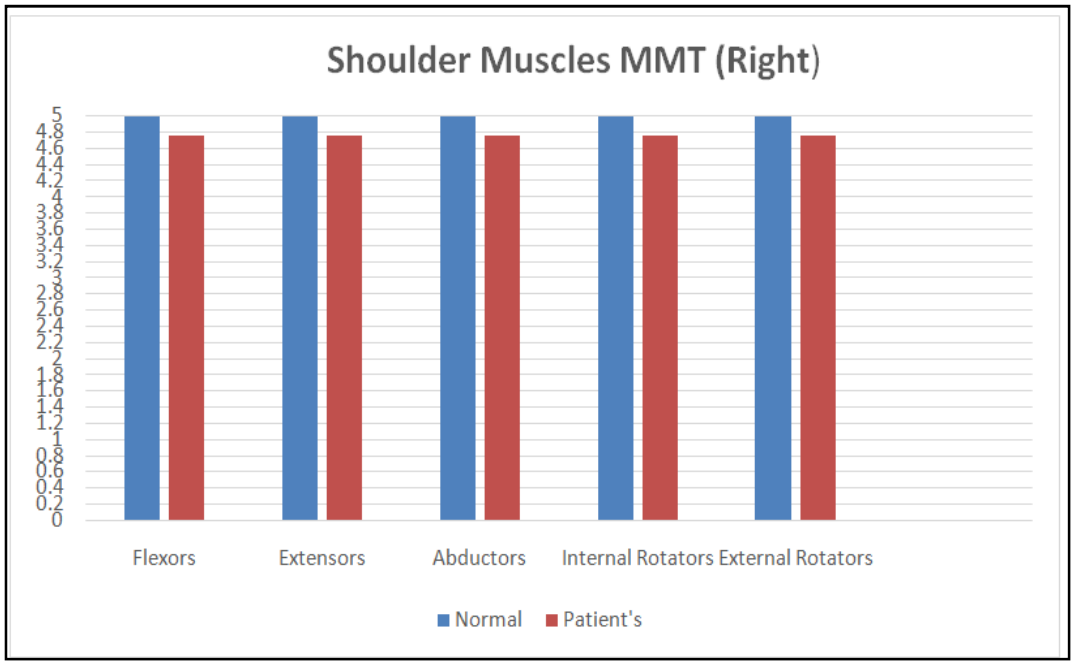
- Ethical Clearance was obtained from Institutional Ethical Committee, DVVPF'S COPT, Ahmednagar.
- Subjects were informed about the procedure and their consent was taken.
- Patients receiving radiation/chemotherapy were recruited from Oncology Departement, Dr. VitthalraoVikhe Patil Memorial Hospital, Ahmednagar.
- Range of Motion & Manual Muscle Testing were administered in these patients.
- The results were analysed.

RESULTS

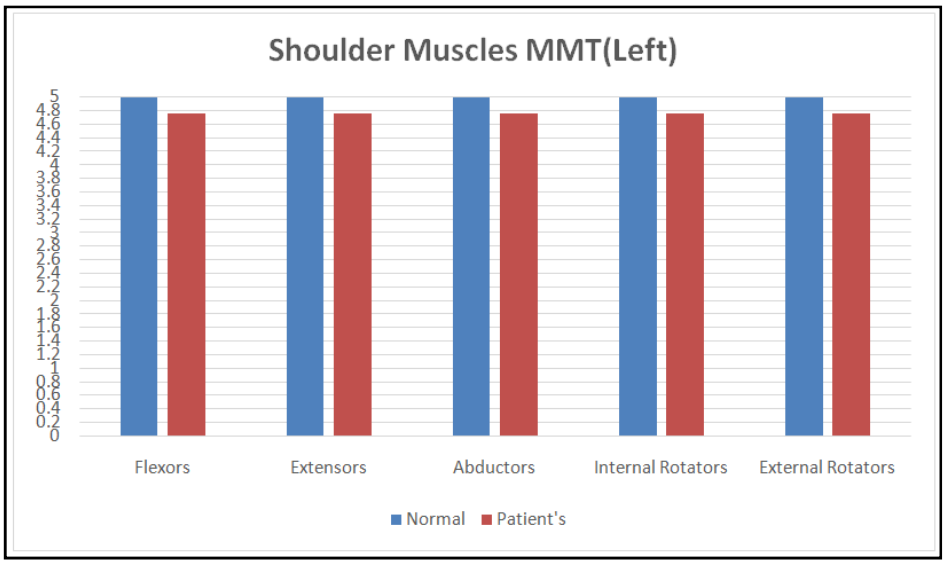
The results of the study show that the mean strength of shoulder flexors, extensors, abductors, internal rotators, external rotators bilaterally was 4.75. The mean strength of cervical flexors, extensors was found to be 4. For the lateral flexors, lateral rotators bilaterally it was 4. All the 4 patients show cervical muscle weakness & one out of the 4 shows both neck as well as shoulder muscle weakness. There is a well-marked difference between strength of cervical muscles of patients undergoing radiation therapy/ chemotherapy in head and neck cancer as compared to that of a normal individual.

DISCUSSION

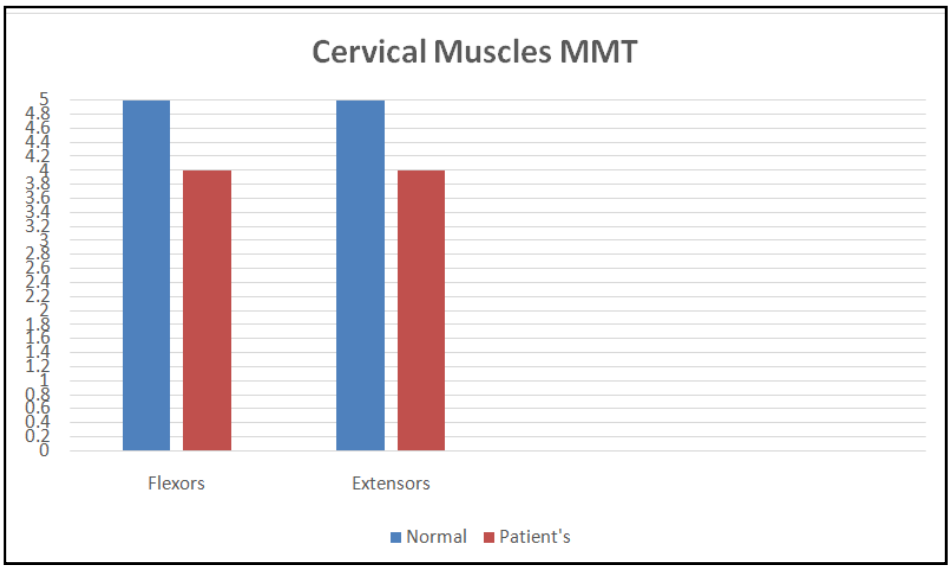
Head and neck cancers are emerging as a major health problem globally. One of the major form of treatment is radiation therapy which has a number of side effects like many patients experience fatigue which builds up throughout the treatment period, especially if the treatment course takes several weeks.
This pilot study found that there is a difference between the strength of cervical muscles of patients undergoing radiation therapy/ chemotherapy in head and neck cancer as compared to that of a normal individual. The study found out that that there is an incidence of neck muscle weakness i.e Grade 4 of MMT in all the 4 patients.
For shoulder muscles, only one patient showed shoulder muscle weakness not giving a clear idea about shoulder muscle weakness prevalence. This might have been due to a smaller number of subjects considered. But we can still predict that there must be an incidence of shoulder muscle weakness in these patients. Out of the 4 patients, there is incidence of both shoulder as well as cervical muscles weakness in one patient which correlates with a study conducted by Kogan A published in Neurological Bulletin, New York. This study concludes that radiation induces vascular changes and results in increase of collagen content and proliferation of fibrous tissue in vessels, eventually leading to denervation of muscle cells which causes muscle weakness [1].



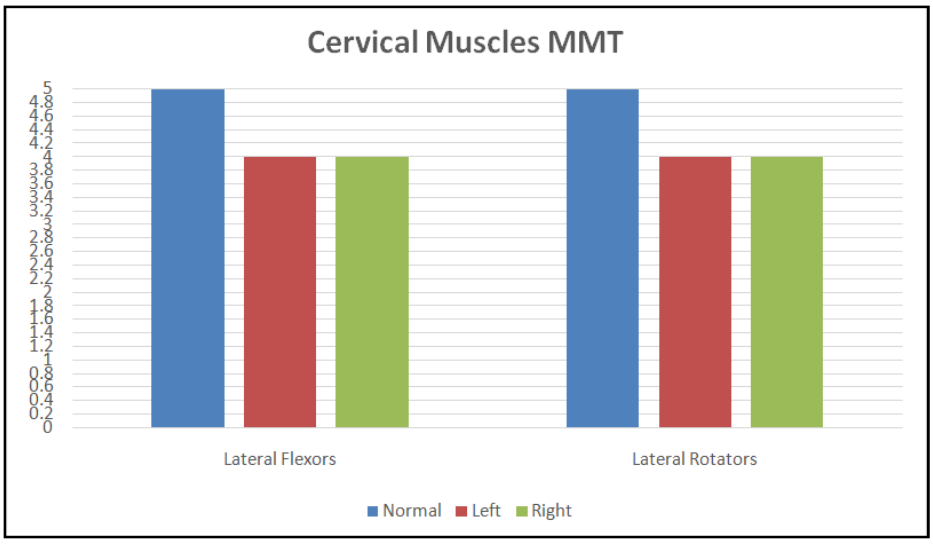
Graph 1: Comparison between strength of Right Shoulder muscles of a normal individual with patient receiving radiation therapy or chemotherapy for head and neck cancer



Graph 2. Comparison between strength of Left Shoulder muscles of a normal individual with patient receiving radiation therapy or chemotherapy for head and neck cancer



Graph 3. Comparison between the strength of Cervical Flexors & extensors of a normal individual with patients receiving radiation therapy or chemotherapy for head and neck cancer



Graph 4. Comparison between strength of Lateral Rotators, Lateral Flexors of a normal individual with patients receiving radiation therapy or chemotherapy for head and neck cancer

In the 3 subjects there was found to be a decrease only in the strength of cervical muscles. The reason might be due to exposure dose differences or the differential damaging effects on capillaries and other vascular structures. The reason might have been that it is a late complication of radiation/ chemotherapy. A study conducted in Iran states that radiotherapy of the neck might damage the spinal cord and corresponding roots, causing five different syndromes like myelopathy. Also, it concludes that the cervical region is the most common part of the cord to be affected, and most reports of the pathology of radiation myelopathy have been of lesions at this site [2]. The results of this study are similar to our study which shows a significant difference of the strength of the cervical muscles as compared to that of a normal person.

Thus, the incidence of neck muscle weakness is markedly significant in patients receiving radiation/ chemotherapy in head and neck cancer patients. The shoulder muscles may also be involved in such patients but greater sample size is required for more detailed results. This study can be conducted on a larger number of subjects to get more accurate results. Also, the evaluation of shoulder muscle weakness is important in more follow up patients since it maybe a late complication of radiation/ chemotherapy. This is crucial as physiotherapy interventions can be applied throughout the period of radiation therapy to maintain the strength of the cervical as well as shoulder muscles. An exercise protocol can be designed for the same to maintain the mobility of shoulder as well the cervical region.

Conclusion

The study concluded that there is an incidence of cervical muscle weakness in patients receiving radiation/ chemotherapy in head and neck cancer. Since the study also found out that there is incidence of shoulder muscle weakness along with cervical muscle weakness, it is necessary to assess shoulder muscle strength in a large study in head and neck cancer patients. Physiotherapy has a crucial role in maintaining & improving the strength of the muscles, thus it is important to find the incidence of the weakness in patients with head and neck cancer, so that it doesn't hamper a patient's quality of life.

Future Scope: This study can be conducted on a large population to get more accurate results on neck and shoulder muscle weakness. This is important so that physiotherapy interventions can be applied pre, post radiation as well during the course of treatment to prevent complications and help patient to cope up with the treatment. Also, early and late effects of radiation therapy in conjunction with chemotherapy can be evaluated with a large number of samples.

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