Evolution of serum carcinoembryonic antigen in head and neck carcinoma patients

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Abstract---Background: Malignancies of the head and neck region are top five leading cancer sites in India. Carcinoembryonic antigen (CEA), which belongs to a family of related cell surface glycoprotein's, is the most often utilized tumor marker in the clinical practice. It is a tumor marker for colorectal, gastrointestinal, lung, Head & Neck, and breast cancer. Aims and Objectives: The present study was planned to evaluate the levels of CEA in patients with head and neck carcinoma. Materials and Methods: In the present case control study, serum CEA was determined in 50 Head and Neck cancer patients and 50 age matched healthy individuals were taken as control. Diagnosed cases of Head and Neck cancer age above 18 years were included and patients on chemotherapy and radiotherapy and patients after surgery were excluded from the study. Results: On comparing serum CEA levels with control group, a significant increase in serum CEA levels was noted in cases (2.70±1.71) ng/ml when compared with control group (1.90±0.57) ng/ml. Conclusion: Evaluation of CEA at an early stage of cancer can be helpful in predicting its prognosis and hence guide the treatment protocol.

Keywords---Head & Neck Cancer, CEA, Cancer.

Introduction

Cancer is a crucial health problem and one of the primary causes of death globally. The increasing trend in cancer globally could be slowed and reversed if preventive measures could provide a feasible approach.[1] In India there are around 2.5 million cases of malignancy at any given point of time[2]. According to estimates from the International Agency for Research on Cancer (IARC), in 2018, it is estimated that the cases of cancer will 27.5 million new cases and 16.3 million cancer deaths. Cancer is a group of diseases involving abnormal and uncontrolled *cell growth* with the potential to invade or spread to other parts of the body.[3]

Head and neck cancer are the term used to describe several different malignant tumors that develop in or around the throat, larynx, nose, sinuses, and mouth. Most head and neck cancers are squamous cell carcinomas.[4] Oral squamous cell carcinoma (OSCC) is the most prevalent malignancy of the oral Cavity. It accounts for 2–3% of all cancer[5]. Various risk factors have been associated with Head and Neck Cancer i.e. Alcohol, betel nut, and cigarette consumption increased the risks of oral cavity cancer[6], of which use of tobacco is an independent risk factor. Tobacco-related cancers account for 45% and 20% of total cancers among men and women.[7]

The harmful carcinogenic products in tobacco; are the tobacco associated nitrosamines (TSNA). Tobacco is routinely consumed either by chewing or tobacco composed snuff, which altogether considered as smokeless tobacco. The increased risk is due to the presence of tobacco-specific N-nitrosamines (TSNAs). N-nitrosonornicotine (NNN), 4-methyl- N-nitrosamino-1-(3-pyridyl)-1 butanone (MN), N-nitrosoanatabine (NAT), and N-nitrosuanabasine (NAB) are the four principal compounds. Chewing tobacco has been found in 28% of Indian men and 12% of women compared to 44% of American men and 0.3% of American women. Alc ohol on its own is not carcinogenic but its conversion to acetaldehyde is carcinogenic, and consumption of alcohol drinks everyday has been shown to increase the risk of developing head and neck cancers .This is thought that, alcohol acts as a solvent for carcinogens from associated risk factors, and the acetaldehyde also causes cellular DNA damage.[8] Tumor markers are important tools to mainly predict and assess response to therapy in cancer patients. Tumor markers play an important role in early detection of the disease and of recurrence of tumor, and hence in improving the clinical outcome. The most used tumor marker over the years was Carcino Embryonic Antigen (CEA).[9]

Carcinoembryonic antigen (CEA)

Which belongs to a family of related cell surface glycoprotein's, is the most often utilized tumor marker in the clinical practice. It is a tumor marker for colorectal, gastrointestinal, lung, Head & Neck, and breast cancer.[10] It is a glycoprotein that contains 45-50% carbohydrates. It is a single polypeptide chain consisting of 641 amino acids, with lysine at its N-terminal position.[11] CEA levels may be higher in patients with advanced cancer or metastatic cancer than in those with localised cancer.[10] Because CEA lacks disease sensitivity and specificity, it cannot be used for screening the general asymptomatic population, a subpopulation with a high

risk for malignancies, or for independently diagnosing cancer. CEA levels are also increased in cigarette and mixed hookah/cigarettes/bidis smokers although to a lesser extent.[12]

Materials and Methods

The study was conducted in department of Biochemistry in collaboration with the department of Medical Oncology, Mahatma Gandhi Medical College & Hospital, Jaipur. The study was conducted after seeking approval from the Institutional Ethics Committee (IEC) and informed consent was taken before enrolling the patients for the study. In the present case control study, serum CEA was determined in 50 (n=50) Head and Neck cancer patients and 50 (n=50) age matched healthy individuals were taken as control. Diagnosed cases of Head and Neck cancer age above 18 years were included and patients on chemotherapy and radiotherapy, anemic patients and patients after surgery were excluded from the study. Blood samples were collected from all enrolled subjects by venipuncture using standard aseptic techniques.

Investigation:

CEA by Enhanced CLIA method: Parameter was estimated using Vitros 5600. Vitros 5600 is a fusion analyzer which can show performance on both dry chemistry and wet chemistry as well. It is based on the principle of: Colorimetric (CM), Potentiometric (PM) and Immuno-rate (IR). The results obtained were presented as mean ± SD. P value ≤ 0.05 was considered as statistically significant.

Results

According to ICMR, cancer statistic 2018, these cancers are among top 5 cancers in India because head & neck cancer are quite prevalent in males due to high consumption of tobacco, smoking habits. Late diagnosis, formation and metastasis of additional primary tumors greatly contribute to this low survival rate. Among 50 Head and neck cancer patients 44 (88%) were male and 6 (12%) were female. Male patients have a higher incidence and prevalence rate of HNC as compared to female. The most prevalent site of HNC patients was oral cavity (76 %) which is followed by site oropharynx (10%), larynx (10%), para nasal sinus (4%).

CEA is measured in Head & Neck cancer cases and healthy controls. Mean value of Serum CEA in Head & Neck cancer cases is 2.70±1.71 ng/dl between healthy controls is 1.90±0.57 ng/dL. There is a statistically significant difference in mean CEA levels between Head & Neck cancer cases and healthy controls.
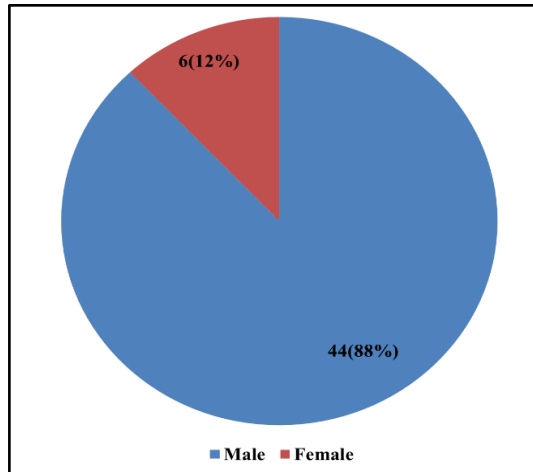
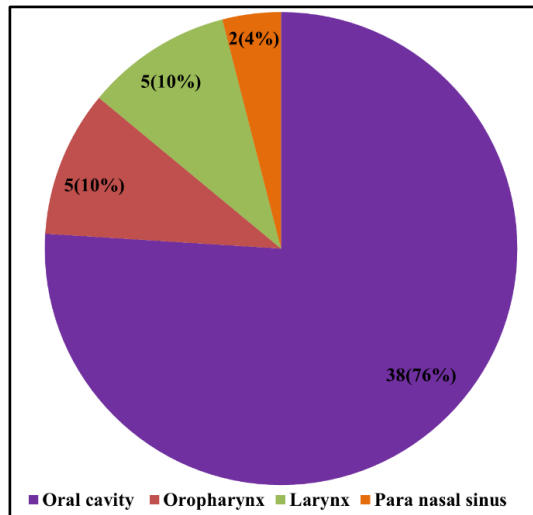Fig 1: Distribution of cancer patients on the basis of gender

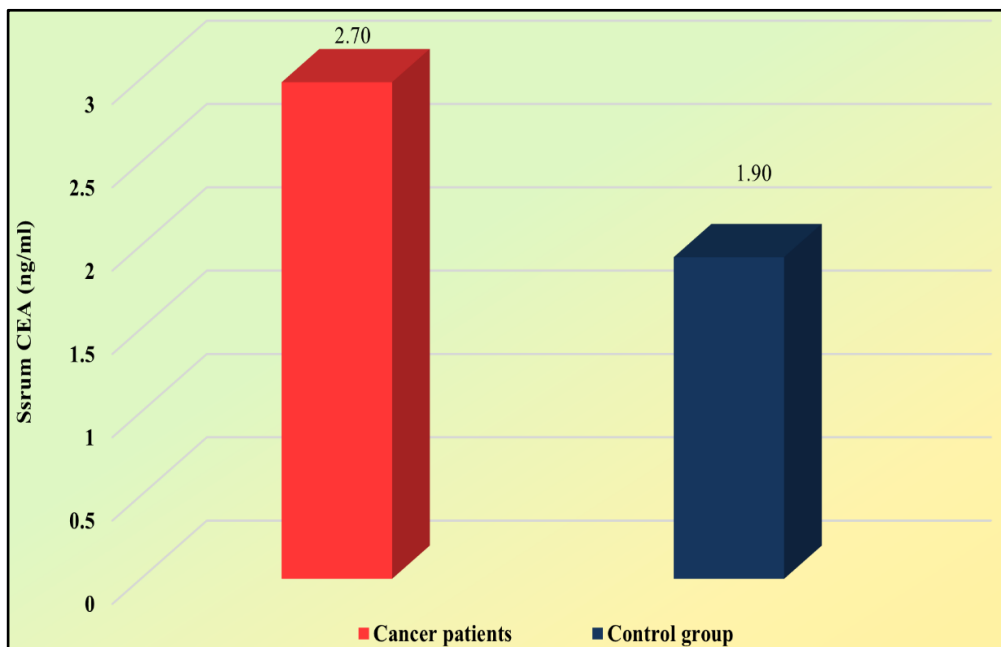Fig 2: Distribution of cancer patients on the basis of site of cancer

Fig 3: Comparison of mean CEA levels between Cancer patients and Control group

Table 1: Comparison of mean CEA levels between Cancer patients and Control group

	Cancer patients (n=50)	Control (n=50)	t-value	P- value
CEA (ng/ml)	2.70±1.71	1.90±0.57	3.24	<0.05

Discussion

Cancer is a term used for a group of diseases that are caused by the uncontrolled growth of abnormal cells. A defining feature of cancer is the rapid generation of abnormal cells that grow beyond their normal limits and can then invade nearby parts of the body and metastasize to other parts of the body. This latter process is called metastasis. Metastasis is the leading cause of cancer death.

In the study among the 50 subjects, 88% were males and 12 % were females for all anatomical sites which implicate the increased use of tobacco and betel nuts in males. The male: female ratio was comparable with that of control group. This finding was similar to the study conducted by Toner and O'Regan et al 2009.[13] In the study, oral cavity cancer had a greater prevalence (76%) followed by CA pharynx, CA larynx and CA Para nasal sinus. The dominant important risk factors for development of HNC are consumption of alcohol, tobacco, and other risk factors include genetics, HPV infection as well as inflammation. Tangjaturonrasme et al. 2017, found that oral cancer, nasopharyngeal cancer and

laryngeal cancer were the most common in men, while thyroid cancer and oral cancer were found in women.[14] There are a number of benign conditions that may lead to elevations in serum CEA level including cigarette smoking, pancreatitis, biliary obstruction, peptic ulcer disease, and hypothyroidism, but the extent of elevation is substantially less, and it is rare to see an elevation of >10 ng/ml in this context.[15]

CEA was measured in HN cancer cases and healthy controls. Mean value of Serum CEA in HN cancer cases is 2.70±1.71ng/dL between healthy controls is 1.90±0.57ng/dL. There was a statistically significant difference in mean CEA levels between HN cancer cases and healthy Controls as shown in Figure 2.4. (P<0.0001). Van Dalen et al., 2014 reported that rise in the level of CEA at the time of tumors regression and fall in the level at the time of tumor progression.[16]

Conclusion

In Head & Neck cancer patients the levels of CEA were significantly increased when compared with healthy individuals. CEA is the most useful serum tumor markers in patients with Head & Neck cancer. Serial determination of this marker may be beneficial in early detection of recurrence or metastasis. So, evaluation of CEA at an early stage of cancer can be helpful in predicting its prognosis and hence guide the treatment protocol.

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