Summary on stomach cancer biology essay

Stomach is a muscular, elastic and pear-shaped organ for digestion which is located in the alimentary canal beneath diaphragm. Researchers have identified that the whole of stomach can be divided into 4 sections with each part having a specific role to play in digestion process. They are (1) cardia, which is involved in draining the contents from esophagus to stomach. They mainly consist of mucous secreting glands. (2) Fundus, a muscular region lying above the diaphragm, forming the upper part of the stomach. (3) corpus/body, which forms the central region and covers most of the histological part. They consist of straight, tubular glands which secrete gastric juices as well as protective mucous. (4) Pyloris, which forms the lower section of the stomach for emptying the contents to large intestine. They contain mucous secreting cell. Now on further analysis on the type of cells present in the stomach, we have come to know about 4 different cells namely (1) mucous secreting cells, lining the luminal surface of the stomach. They are involved in the production of mucous and bi-carbonate salts. (2) Mucous neck cells, involved in the production of mucin. (3) Parietal cells, present for the entire length of the stomach, mostly in the mid regions and are involved in the production of gastric acid and (4) chief cells/peptic/zymogenic cells, which produce pepsinogen for the digestion of proteins. Understanding these regions in-depth helps us to focus on the mechanisms carried out by the carcinogens of tobacco smoke in causing cancer.

Fig. 1. Histology

Stomach cancer is another most commonly occurring cancer among smokers. Smoking causes ulcers by adversely affecting the gastric mucosal

defense. It was found that the main stream as well as the side stream smoke from cigarettes, contains the carcinogen N-nitoso compound that are responsible for gastric cancers. Smoking causes the influx of bile salts from the intestine to the stomach making the stomach acids more harmful. Cigarette smoking reduces the thickness of gastric mucosal layer by reducing the mucus layers synthesis and also reduces the activity of Gastrin mucosal ornithine decarboxylase activity which as negative effect on ulcer healing. People who already have ulcers are advised not to smoke as smoking reduces their healing which can later turn to be cancerous.

The different forms of carcinoma of stomach include (1) Adenocarcinoma, which develops in the innermost cell lining of the stomach or the mucosa. It constitutes about 90%-95% of gastric cancer. (2) Lymphoma, which are the cancer of the immune system and mainly seen on the inner walls of the stomach. (3) Gastrointestinal stromal tumour, which are rare tumours that starts in the cells of the stomach wall and (4) Carcinoid tumour, which are tumours of the cells involved in hormone production. It accounts for 3% of the whole gastric cancer.

The different stages of development of stomach cancer involve:

Stage 0: Found in the inner layer of the stomach. Also known as carcinoma.

Stage 1: The tumour spreads to the sub-serosa and also upto 6 lymph nodes. This stage can be also said as the tumour spreads to muscle layer and not the lymph nodes.

Stage 2: This stage can be classified as 3 forms. In this stage the tumour invades only the submucosa and spreads to 7-15 nodes. Else the tumour might have spread to the muscle layer or subserosa. Cancer spreads upto 1-5 lymph nodes or else the tumour cell might have spread to the outer layer of the stomach and doesn’t affect the lymph nodes.

Stage 3: Here the tumour spreads to the muscle layer/subserosa and spreads 7-15 lymph nodes or the tumour spreads to the outer layer spreading to just 1-5 lymph nodes or this stage includes the tumour spreading to nearby organs such as spleen, colon or liver and has not spread to lymph nodes.

Stage 4: in this the cancer has spread to more than 15 lymph nodes. The tumour might have also spread to nearby/ distant organs.

Mechanism

Through smoking the gastrin secretions in stomach. Gastrin is secreted by antral G- cell and is involved in the stimulation of secretion of HCL from parietal cells into the gastric lumen. The acid then acts on the antrum which in turn reduces the release of gastrin and thus HCL. Smoking affects this negative feedback mechanism. This in turn increases the circulating gastrin levels. Acute smoking causes thus raises the amount of gastrin which as a tropic effect on the parietal cells which in turn increases the volume of acid in stomach. Smoking affects the mucosal region of stomach. It has the risk of developing lesions such as dysplasia, chronic atrophic gastritis and intestinal metaplasia in the gastric region which can later turn to be malignant. The

carcinogens present in tobacco smoke either comes in direct contact or through blood circulation on gastric mucosa and impairs them.

Understanding at the genetic level

TABLE

GENES

FUNCTION

MUTATION

NATIVE POSITION

CDH1

It plays a key role in cell adhesion, which is vital to the normal development and maintenance of cells.

160C/A

Chr 16q22. 1

MDR1

It is an important ATP-dependent membrane transporter, which is involved in

the absorption, distribution, and elimination of numerous drugs and acts as an energy-dependent efflux pump that exports

its substrates out of the cell. The MDR1 gene encodes P-gp that is the protection of an organism against toxic xenobiotics.

C3435T

Chr 7q21. 13

CYP1A1

This gene, CYP1A1, encodes a member of the cytochrome P450 superfamily of enzymes. The cytochrome P450 proteins are

monooxygenases which catalyze many reactions involved in drug metabolism and synthesis of cholesterol, steroids and other

lipids.

CYP1A1 Ile/Val

Chr 15q24. 1