organs and systems, as well as due to administration of a number of substances.

**Digestion** begins in the oral cavity during mastication of food and continues in the stomach where the chyme is triturated with hydrochloric acid, mucus, enzymes and other components of gastric juice. Partially processed chyme is propelled from the stomach into the small intestine where hepatic and pancreatic secretions are admixed. Their function is to split the nutrients and thus to enable absorption of proteins, carbohydrates and fat. Useful substances resulting from digestion are absorbed through the wall of the small intestine into the blood and lymphatic vessels; thereafter they are transported to the liver where they are stored or processed further. Chyme components which are either not useful or not utilised enter the colon. Water and some of the substances are absorbed in the colon being thereafter eliminated by urine. The remnant substances constitute the basis of stool.

All processes carried out in GIT, apart from mastication of food and defecation, are controlled by the autonomous nervous system and hormones. The autonomous nervous system, its sympathetic and parasympathetic parts, are controlled by higher centres in the brain as well as affected by local factors.

The **oral cavity** basically serves for the prepreparation and mixing of food with saliva. The oral cavity contains many nervous endings which trigger the process of digestion as soon as the food enters the oral cavity. The lingual surface contains thousands of chemoreceptors and taste buds which are able to distinguish taste components of food: salty, bitter, sweet, and sour. The entire process has its meaning in initiating the secretion of gastric juice.

The oral cavity is moistened by saliva originating from three pairs of salivary glands, namely submandibular, sublingual and parotid. The principal constituents of saliva are water, mucus, sodium, bicarbonates, chlorides and potassium. Salivary alpha-amylase, the further significant component of saliva (previously referred to as ptyalin) initiates the digestion of carbohydrates already in the oral cavity. Further digestion of carbohydrates continues later in the stomach.

Salivation is controlled by the parasympathetic and sympathetic nervous systems. Application of atropine inhibits salivation and evokes the feeling of dryness in the mouth. The composition of saliva depends of the velocity of secretion. Slow production intensifies reabsorption of sodium, chlorides and bicarbonates in the draining ducts of salivary glands.

## 7.2 Oesophagus

### 7.2.1 Deglutition

The oesophageal anatomical structure is relatively simple. Basically, it is a tube which connects oropharynx with the stomach. Deglutition is a process which forces the food bolus to proceed in aboral direction to the stomach. This action takes place owing to the contraction of circular and longitudinal muscles of the oesophagus. The upper third of the oesophagus is equipped with striated musculature innervated by motor nerves. The lower two thirds of the oesophagus are constituted of smooth muscles which are innervated by preganglionic cholinergic fibers of the vagus nerve. The oesophagus is an ideally enclosed tube. Upper oesophageal sphincter inhibits penetration of air into the oesophagus during inspiration. The lower oesophageal sphincter inhibits regurgitation of the stomach contents. This function of the lower sphincter is of great importance because the intraabdominal pressure is higher than the intrathoracic or atmospheric pressures.

The act of deglutition is a complex action which is regulated by the deglutition centre localised in the reticular formation. Basically, the deglutition takes place in two phases: oropharyngeal phase which is governed by voluntary control, and oesophageal phase. The task of the **oropharyngeal phase of deglutition** is to propel a part of food into the upper oesophagus. A sufficiently high pressure must be developed in order to overcome the resistance of the upper oesophageal sphincter. The basic fact in this phase is that the deglutition is simultaneously accompanied by stoppage of respiration, and the epiglottis inhibits the penetration of food into the trachea.

The **oesophageal phase of deglutition** begins as soon as the food bolus enters the oesophagus. Peristaltic movements of the oesophagus transport the bolus as far as to the lower oesophageal sphincter.

The latter reflexively becomes relaxed as the food bolus occurs in its proximity. After the transition of the bolus, the tension of the distal sphincter is renewed. The oesophageal phase of deglutition takes 5–10 seconds. Under physiological conditions, the bolus's motion velocity is 2–6 cm/sec.

Each food bolus when forced into the oesophagus stimulates the receptors sensitive to distension. Consequently, the impulses of the deglutition centre increase, thus initiating the peristaltic movements of the oesophagus. The distal sphincter constitutes a barrier between the oesophagus and stomach. The tension of the distal oesophageal sphincter is affected by nervous and hormonal pathways. Progesteron, secretin and glucagon affect the distal oesophageal sphincter in sense of its relaxation. On the contrary, gastrin increases the tension of the lower sphincter. During deglutition, the sphincter's relaxation is procured by the vagus nerve.

## 7.3 Diseases of the oesophagus

### 7.3.1 Dysphagia

Impairments of oesophageal functions are manifestant by swallowed food being held up in its passage within the oesophagus. The patient is often able to assess the site where the bolus has stuck. Dysphagia can be caused by impaired oesophageal motility, oesophageal stricture, benign or malign processes. If dysphagia appears after meal, it is mostly due to the impairment of motility. The patient is unrestful, performs the so-called Valsalva maneuver, or repeatedly swallows until the bolus is forced further.

**Pyrosis** is a frequent oesophageal symptom which is percieved as a burning retrosternal discomfort. This sensation is caused by the reflux of the gastric contents into the oesophagus. It can be suppressed by antacids. More frequently it appears after occupying a recumbent position. Sometimes the burning retrosternal sensation is associated with a sensation of bitter or acid tastes. The reflux of the gastric contents into the oesophagus during sleep, can cause aspiration pneumonia.

**Odynophagia** is a pain which appears in coincidence with deglutition. It usually is associated with oesophageal obstruction, mucosal impairment, infection or reflux oesophagitis.

Abrupt retrosternal pain is most frequently a symptom of ischaemia of the heart muscle (angina pectoris), but it can represent a consequence of abnormal motoric oesophageal function, or diffuse oesophageal spasm.

### 7.3.2 Gastro–oesophageal reflux

The gastro-oesophageal reflux represents a reverse flow of the gastric or duodenal contents into the oesophagus. It appears owing to a wide spectrum of impairments. The oesophagus is normally protected against the prolonged effect of gastric acid, pepsin, bile acids and pancreatic enzymes. The protection is carried out by three mechanisms:

1. the antireflux barrier is formed by tonic contraction of the lower oesophageal sphincter
2. fast backward shifting of the regurgitated material
3. neutralisation of the acidic material in the oesophagus by swallowed saliva

The patients with gastro-oesophageal reflux usually develop one of the following detectable impairments:

a) decreased tension or sluggishness of the lower oesophageal sphincter,

b) impaired coordination of relaxation of the lower oesophageal sphincter

c) decreased neutralisation and oesophageal peristalsis

The gastro-oesophageal reflux can cause the development of oesophageal peptic ulcer or stricture.

### 7.3.3 Motor impairments of the oesophagus

Impairments of oesophageal motility can appear in consequence of changes in the smooth musculature (sclerodermia), or in the nervous system (achalasia). **Systemic sclerodermia** develops owing to atrophic changes in the smooth oesophageal musculature. Muscular contractions of the lower two thirds