THE VOMITING

**Definition** : a reflex act of expulsion of the stomach content via the esophagus and mouth. The vomit may entirely consist of stomach content or may contain matter from the duodena and the upper intestine that gives it a particular aspect.

The vomiting is often an important associated symptom but may also be the major symptom of a more or less severe disease that needs immediate therapy.

More than 50% of the suckling experience vomiting, but only 5% of these children suffer from digestive problems. The rest of them have a common digestive tract immaturity that leads to the so-called **habitual vomiting** of the newborn and suckling which is sometimes triggered by a specific food-stuff.

**Mechanism** of the vomiting : v. results from the associated contraction of the diaphragm, the abdominal wall muscles and the smooth muscular fibers from the stomach wall. Vomiting (v.) develops in 3 stages :

a) nausea

b) the effort that precedes vomiting

c) the expulsion

Except the CNS diseases, nausea usually precedes and accompanies vomiting. Frequent findings : excessive salivation, sweating, variations of the heart rate. The nausea is determined by the lack of gastric motility or by the excessive duodenal motility, but may also be caused by a variety of stimuli, including psychic, CNS, internal ear and different organs. In small children the nausea and the effort are difficult to be noticed and the vomiting frequently occurs with no advertisement. In some cases grimaces, restless, paleness, salivation and sweating suggest nausea.

The strictly speaking vomiting corresponds to the relaxation of the cardial sphincterus, contraction of the pilorus and the intense contraction of the diaphragm and abdominal wall.

**Vomiting is to be differentiated from regurgitation and rumination.**

**Regurgitation** = effortless backward flow of a small amount of food or secretion from the esophagus and stomach into the mouth. It doesn't associate nausea or contraction of the diaphragm and abdominal muscles, being caused by the contraction of the pyloric region of the stomach which pushes the gastric matter into the esophagus through the opened cardial sphincterus. The fluid eliminates along with some air.
The "physiological regurgitation" occurs during the first weeks of life in the healthy newborn, one or several times daily, next to meals. In time they become more and more rare, so that they stop at the age of 7-12 month. Regurgitation represents no danger for the child's health as long as it doesn't interfere with normal growing.

**Regurgitation due to improper technique used for feeding.**

When the infant is put in bed right after the meal, without waiting for eructation, regurgitation becomes probable. Other causes for habitual regurgitation may be **hidden nipples** and the **too small orifices of the feeding bottle**, so that the feeding becomes slower and a big amount of air is swollen in the same time.

**Violent movements after meal** may be another cause for regurgitation. When no feeding mistake can be found the regurgitation is caused by **esophageal reflux** and can be found by X-ray examination. It may also be possible cause for night coughing and recurrent pneumonia and bronchopneumonia.

**The ruminating** consists of a bring back of the food from the stomach into the mouth, when it is once again chewed and then swallowed. The child seems to particularly enjoy this act. This occurs during the second half of the second year of life, 20 or 30 minutes after meals, in those children who lack care and affection, so it seems to have a psychogenic nature. The child actually lays most of the time in a puddle of stomach matter, although few food is wasted in this way. The therapy consists of:

- Keeping the child's attention focused on some activity that's interesting to him until the stomach evacuates in the duodenum;
- placing the child on the abdomen after each meal;
- feeding the child with more dense food; -more attention from those who taken care of the child.

The results depend on the precocity and perseverance of the therapy, otherwise the child gets gradually underweighted.

The increased frequency of vomiting in suckling is due, at least in part to:

- fluid food
- air swallowing produced by sucking
- relaxation of the cardial sphincterus and contracted (spastic)pilorus
- the position during and after eating.

In order to find out the cause of vomiting a **complete investigation** should be performed:
**Inquiry:**

1)should differentiate vomiting from saliva and regurgitation;

2) will take notion of the age of the child, each age having specific causes for vomiting. The sex may also be important.

3) **date of onset**: immediately after birth - before any food has been given
   - after the intake of milk or water with sugar. Two or three weeks after birth

4) **timing and frequency**: does vomiting occurs after feeding how long after meals, next to meals or between meals? What's the frequency of vomiting? (episodic, daily or several times a day?)

5) **which is the position** that promotes vomiting?

   The family will be asked whether the laying on the back position trigger or aggravates vomiting and whether keeping the baby standing provides any relief.

   Sometimes relief is found when laying on the abdomen with the head lower than the rest of the body.

6) **The diet**:
   - **quantity**: overfeeding, underfeeding
   - **quality**: (milk formula, new food stuff; for elder children possibly altered food;
   - **frequency** of meals,
   - **position** while eating;

7) **Psycho-social data**: child's behavior and relationship with the closely related individuals (influenced by subjectivity). Has the child been forced to eat?

8) **The character of vomiting**:
   - **The psychogenic vomiting**: occurs repeatedly at the same moment of the day, for example before leaving for school;
   - **Irritating vomiting** (gastritis) occurs next to the meals in grown-up children, associates nausea and consists of non digested food. Vomiting is sometimes preceded by early satiety sensation while eating;
   - **Central vomiting**: effortless, no nausea is present, projective character;
   - **Morning vomiting**: specific in patients with uremia.

   When a more important amount of vomiting matter than ingested is eliminated a **pyloric stenosis** is to be thought about.

   - **Epidemic vomiting** suggests food poisoning with bacterial toxins. Occurs after about 6 hours from eating;
Vomiting determined by the movement of a vehicle (travel vomiting) is preceded by nausea, extreme abdominal discomfort and sweating;

9) The aspects of the eliminated matter:
In the newborn more than 20 ml of gastric aspiration, especially when bile is present, suggests bowel obstruction. An excessive amount of amniotic fluid is one more proof for bowel obstruction. Regurgitation and vomiting of uncoagulated milk suggests esophageal atresia in the newborn and esophageal stenosis in the grown-up child (undigested food elimination);
bile vomiting suggests bowel obstruction in the newborn and dynamic occlusion in case of septicemic state;
faeces vomiting occurs in large intestine obstruction and peritonitis
blood vomiting:
- fresh blood: superior digestive tract hemorrhage
- digested blood: major sign in DIC

10) The influence of vomiting on weight, evolution:
- normal progression of weight = benign vomiting
- stop of progression
- sudden loss of weight = acute dehydration

11) The aspect of the stool: may be normal, diarrhoea, constipation, melaena.

12) Are to be evaluated:
- general health state
- associated symptoms: fever, convulsions, etc.
- history of diseases that may cause vomiting

13) Previous diets and drug treatments

CLINICAL FINDINGS:
Although the digestive system is the most carefully checked, every other system of the body will be attentively examined.

LABORATORY FINDINGS focus on two directions:
a) the disease that determines vomiting
b) the effect of vomiting on the general health (consequences and complications)

Consequences or complications:
- metabolic disorders: occur mostly in case of chronic vomiting:
metabolic alcalosis and hypokaliemy: every 100 ml of lost water contain about 10 mEq Na⁺, 2 mEq K⁺ and 10 mEq Cl.  

Signs of low potassium serum levels; muscular weakness, constipation, excessive thirst, nicturia and low concentration urine.

hypoglicemy:
- acute dehydration syndrome;
- pneumonia caused by fluid aspiration: mostly in preterm newborns and children with troubles of conscience. It also occurs when vomiting while laying in bed.
- rupture of the esogastic jonction mucosa: leads to perforation in some of the cases.

THE CLASSIFICATION OF VOMITING BY ITS CAUSES
(Green & Geormăneanu)

I Mechanic v.
II Reflex v.
III Metabolic v.
IV Central v.

I MECHANIC VOMITING: is usually due to congenital or acquired obstructive malformations of the digestive tract.

Congenital abnormalities become evident early during the neonate period.

Suggesting signs:
- more than 2000 ml of amniotic fluid
- more than 20 ml of aspirated gastric fluid, especially when green coloured
- vomiting and abdominal distension in the first 24-36 h after birth
- elimination of the meconium does not occur.

ESOPHAGUS
1) Atresia and stenosis of the esophagus:

- with no communication between the esophagus and the trachea.

Excessive salivation and vomiting of any ingested fluid (should be avoided).
- with tracheal communication: excessive salivation, cyanose - suffocation, cough, noisy breath.

The symptoms develops whenever food is ingested.

Radiographic examination: no air inside the stomach and intestines after several hours from birth.
- broader stenosis: vomiting develops later in time, after solid food has been given.
2) Esophageal diverticulum:
- vomiting in the first days of life, soon after feeding
- offensive breath (food decomposes inside the diverticulum)
- barium X ray examination is diagnostic
3) Brachi esophagus: short esophagus.
Vomiting occurs during the first days after birth.
4) Cardio-esophageal relaxation (calazia): early vomiting that is interrupted when the child is kept standing after being fed.
5) Cardial spasm (acalazia): vomiting occurs immediately after feeding and associates disphagia (unability to end swallowing). Solid and semisolid food is tolerated better than fluids. Enlargement of the upper esophagus (mega esophagus) due to the permanent contraction of the lower esophagus. Therapy: sedative drugs.
6) Esophageal stenosis due to the ingestion of caustic substances.
Vomiting and disphagia develops in 2 or 3 weeks after the ingestion.

STOMACH
1) Diaphragm herniation: vomiting, dispnoea, cyanose.
2) Congenital hypertrophic stenosis of the pylorus: vomiting that occurs in male newborns after 2-3 weeks from birth. Projectile high quantity vomiting, loss of weight.
3) Pyloric spasm (doubtful disease): small amount vomiting right after eating.
X ray exam: the "all or nothing syndrome": sudden evacuation of the stomach 1 to 3 hours after eating. Therapy: sedative drugs.
4) Gastric folding: occurs because the stomach is pushed by the distension of the transverse colon.
Positional therapy: head=downwards, legs=upwards.

DUODENUM
1) Atresia and tight stenosis - incompatible with living, may cause upper obstruction.
Emergency surgery is needed. The abdomen looks flat.
2) Broad (large) stenosis of the duodenum: vomiting fits after birth or later in time.

SMALL AND LARGE INTESTINE
1) Intestinal atresia: bile vomiting followed by faces vomiting that occurs after some hours from birth. Associated dehydration and toxic state. Emergency surgery is needed.
2) Anal imperforation causes obstruction in the first 24-36 h after birth: vomiting, abdominal distension, lack of meconium elimination.
3) **Meconium ileus**: may be the first symptom in case of cystic fibrosis. The cause is the viscous and highly adherential meconium. The abdominal palpation feels consistent and elastic intestines. The X ray examination of the abdomen shows air bubbles inside the meconium. Meconial peritonitis develops in case of rupture.

4) **Rotation abnormalities** of the small and large intestine:
   - may either cause no symptom or determine an obstructive syndrome during the first weeks of life: bile vomiting, abdominal distension, evident peristaltic contractions, constipation. The disease takes either the aspect of a recurrent obstructive syndrome or intermittent diarrhoea.
   Diagnosis: barium X ray examination shows the abnormal situation and mobility of the caecum.

5) **The volvulus** = twisting of a part of the intestine causing obstruction. It can be determined by the lack of fixation of a part of the intestine (anywhere from the duodenum to the caecum). Bile vomiting onsets early during birth but onset is possible at any age. It sometimes associates abdominal distension and peristaltic contractions of the stomach. The volvulus may lead to the necrosis of the involved part of the intestine or may spontaneously cure. Recurrent obstruction manifestly present as vomiting in grown up children may follow. The volvulus of the sigmoid is also possible.

6) **Duplications of the digestive tract**: determine vomiting and colicky abdominal pain because of partial obstruction.

7) **Strangulation of a hernia**

8) **Invagination** (Intussusception)
   - the inwards folding of a part of the intestine.
   Determines intermittent violent abdominal pain, blood in the faeces as well as in rectal examination, after 6-12 hours. Vomiting, initially with food become with bile and then with faeces. It usually occurs during the first year of life.
   Diagnostic is suggested by abdominal palpation and barrium X ray examination: "target sign".
   Emergency surgery is needed, otherwise death occurs during the first 24-30 hours after the onset of symptoms.

9) **Adherential developments of the peritoneum.**

10) Foreign bodies:
   - hair (trichobezoar)
   - coagulated milk (lactobezoar): mostly in preterm children fed with rich milk formulas.
- parasites (ascarides) worm agglomerations
11) **Hematomas of the intestinal wall**: may develop after slight injuries and leads to vomiting, abdominal pain and even obstruction.
12) **Hirschsprung's disease** (congenital mega colon)- represents from 15 to 20% of the causes that determine vomiting during the first month of life.
   Its symptoms are: constipation, progressive distension of the abdomen and vomiting. It needs surgical correction.
13) **Dynamic occlusion** occurs in children with severe diseases, such as: bronchopneumonia, peritonitis, etc.

**II. THE REFLEX VOMITING**
- induced by stimuli that originate in the gastro-intestinal and genito-urinary tract

**A. GASTRO-INTESTINAL TRACT DISEASES**
1) **Amniotic fluid swallowing**.
   This may contain meconium and blood and determines vomiting during the first 2 or 3 days of life.
2) **The mucus from the pharinx** may trigger the reflex of vomiting, especially after morning awakening.
3) **Wrong technique of feeding**: air swallowing, not suitable for age food, forced nutrition after anorexia.
4) **Food allergy**: rash, Quinque edema, vomiting, abdominal pain.
   Needs diet and antihistamine drugs.
5) **Gastritis** and gastric or duodenal ulcer (rare during childhood)
6) **Acute bacterial or viral gastroenteritis**: frequent vomiting followed by diarrhoea after 4 to 6 hours. Diarrhoea lasts for 6 to 12 hours after vomiting has stopped. Sometimes associates fever and muscular pains.
7) **Necrotizing enterocolitis** : lack of apetite, abdominal distension, diarrhoea mixed with blood, jaundice, dispnoea, hypothermy, septic state.
8) **Gluten enteropathy** (coeliac disease). Vomiting is an inconstant finding.
9) **Acute appendicitis**: vomiting and apendicular pain.
10) **Acute peritonitis**: faeces vomiting.
11) **Hemorrhagic diseases**: bleeding inside the gastrointestinal tract (for example Hennoch-Schönlein disease.
12. **Acute ulcerations and perforations**: stress, drugs.

**B. RESPIRATORY TRACT INFECTIONS**: frequent cause for vomiting.

It is not sure whether vomiting is produced by ingested secretions or infection of the digestive tract.

**C. CARDIOVASCULAR DISEASE**:
Cardiac failure, myocarditis, congenital heart disease.

**D. INFECTIOUS DISEASE**:
Scarlet fever and measles: onset with vomiting.

**E. REFLEX VOMITING IN CASE OF GENITO URINARY DISEASE**.
Vomiting may be the unique finding in small children.

- UTI, pielonephritis (projectile vomiting)
- UTO and hydronephrosys
- Acute glomerulonephritis
- Urinary tract lithiasis

**F. REFLEX VOMITING BY STIMULI FROM THE INNER EAR**
- Middle ear otitis and labirinthitis
- Movement malaises (car, ship, plane)

**G. REFLEX VOMITING BY TOXICS AND DRUGS**:
- Irritation of the gastrointestinal tract
- CNS activity

Salicylates, digitalics, aminophiline, lead, sulphamides, antibiotics.

**H. OTHER CAUSES FOR REFLEX VOMITING**:

1. Diabetic acidosis
2. The Reye's syndrome: onset similarity to an upper respiratory tract infections, but vomiting, abnormalities of the conscience and behaviour disorders follow.
3. Neonate tetany: vomiting, convulsions and muscular spasms
4. Hypercalcemia of unknown cause or following to excessive administration of D vitamin. High blood pressure, renal failure due to calcium deposits, neurological troubles.
5. Pancreatitis: vomiting and abdominal pain
6. Acute renal failure (uremia)
7. Infectious hepatitis
III. METABOLIC VOMITING:
Inherited diseases, early after birth onset.

a) Steroid synthesis disorders:
The congenital adrenal hyperplasia
(21-hydroxilase deficiency is the commonest cause).
Screening: blood electrolytes levels, steroid levels in blood and urine.

b) Ureic metabolism disorders (disorders of aminoacids metabolism): screening evaluation of blood aminoacids levels.

- Hipervalinemia: increased blood valine.
- Phenilketonuria: onset of vomiting after birth.
Rat smell of urine and sweat. Screening: Guthrie test.

b) Disorders of carbohydrate metabolism:
- Galactosemia: becomes manifest after the introduction of the milk nutrition.
Treatment: exclusion of milk and milk preparations from the diet.
- Hereditary fructose intolerance: recurrent nausea and vomiting, diarrhoea, hepatomegaly, hypoglicemia, paleness, excessive sweating and convulsions that occurs after fructose nutrition.
Retardation of growth.
Diagnostic test: specific enzyme determination

c) Disorders of lipid storage:
- Wolman's disease (acid lipase deficiency) that leads to intracellular storage of triglyceride and cholesterol ester.
Onset during the first month of life with vomiting, diarrhoea, hepato-splenomegaly, retardation of growth.

IV. CENTRAL VOMITING
A. CNS diseases:
a) Cerebral edema: determines vomiting and convulsions in the newborn. The cerebral edema due to a trauma may be localized or generalized and leads to vomiting and possible neurological abnormalities.
b) Intracranial hemorrhage (cerebro-meningeal hemorrhage of the newborn)
Vomiting may be the unique symptom. Sometimes convulsions and irritability.
c) Hydrocephaly: due to elevated intracranial pressure.
d) Meningitis, meningoencephalitis, Reye's syndrome.
e) Intracranial abcess.
f) Cerebral tumours.
g) Epilepsy: vomiting and abdominal pain usually precede the seizures but may also be the unique finding in some forms of the disease.
h) The migraine one-sided headache, visual troubles and vomiting, at the end of the stroke.
i) Acute lead intoxication: encephalopathy and elevated intracranial pressure. Projectile vomiting is the first symptom.

B. Central vomiting which is not caused by primary CNS diseases.
- Increased metabolites levels: uremia, diabetic acidosis, cirrhosis, chronic renal acidosis
- Acute infections: septicemia
- Psychogenic vomiting in case of:
  - stressing environment
  - forced nutrition
  - neuropsychic retardation (recurrent or selfdetermined vomiting)
  - school phobia: vomiting usually occurs at home, before or next to breakfast, but also in school, even with an empty stomach. Vomiting stops on Saturdays and Sundays. Abdominal pain may associate.
  - night vomiting - after day time emotional, traumas.
Psychogenic vomiting is hard to treat.
- Ciclic aketonemic vomiting: attacks of vomiting that last for one or several days and occur two or three times a year. The attack onsets during mornings and repeats whenever feeding is tempted. Clinical findings: normal abdominal palpation, no sign of meningitis. The evolution leads to ketosis (severe sometimes).
Ketone smelling breath and blood acidosis. The serum glucose levels are normal or low. In some hours to some days the attack ends by itself with sudden interruption of vomiting, comeback of the appetite and rapidly improving general health state. The cause of such strokes remains unknown. A particular type of epileptic seizure is also to be discussed.
TREATMENT

I. Treatment of cause whenever the cause is known:
- surgery for atresias, piloric hypertrophy, volvulus, intussusception
- severe infections: antibiotics, shock therapy, gastric aspiration (in order to prevent the aspiration pneumonia), parenteral nutrition
- positional treatment in case of stomach folding and gastro-esophageal reflux.
- metabolic disease: dietary treatment (galactosemia: no milk and milk derived products, phenilketonuria: low phenylalanine diet)

II. Repairing treatment:
- oral or parenteral intake of water and electrolites
- correction of ketosis and other troubles of metabolism

III. Symptomatic treatment:
- dense foodstuff
- antispastics
- sedative drugs phenobarbital 4-6 mg/kg/24 h
- antiemetic drugs metoclopramide: 0.5-1 mg/kg/24 h.