The Intestines

Grégoire Lason & Luc Peeters
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1. Introduction

The intestines consist of the duodenum, the small intestine and the colon. They are an essential part of the digestive canal. The duodenum and the small intestine are often compared to a kitchen, where the consumed foodstuff is steamed ready to be used by the body while the colon is compared to the garbage bin where the body’s waste products are collected, ready to be excreted.

Dysfunctions of these organs can lead to local complaints but in many cases such dysfunctions can influence other body systems, which apparently have nothing to do with these digestive organs.

Dysfunctions of duodenum, small intestine and/or colon are often involved in diverse conditions. Some examples are metabolic syndrome, sinusitis, migraines and rheumatism. The organs involved must therefore always be thoroughly assessed by the osteopath.

Recuperation from dysfunction of these organs requires a combination of osteopathic manipulation and mobilization, autonomic and hormonal normalization, influence upon sources of external stress and dietary and lifestyle alteration.

Osteopathy aims for a total treatment of the patient’s health. This treatment approach can influence the structural integrity but also biochemical and metabolic balance.

A person’s state of health is determined by chemical processes, which must be balanced: homeostasis. If this is not maintained the body becomes sick.

These processes are related to:

- Dietary balance.
- The balance of the gastrointestinal system.
- Hormonal balance.
- Immunological balance.
- Good mental health.
- Detoxification.
- The prevention of oxidative damage.

Readers who are not familiar with osteopathic visceral techniques should refer to Chapter 12 of this e-book. The basic principles of visceral osteopathy are described.
2. Anatomy

2.1. Position

2.1.1. General
The majority of the digestive organs are within the abdominal cavity. They are enveloped by two-layered serous membrane:

- The visceral peritoneum, which covers the organs themselves and
- The parietal peritoneum which line the inside of the abdominal cavity.

Between both layers is the peritoneal space, which holds a small volume of serous fluid.

Parts of the digestive tract hang from the peritoneal walls from mesentery: these are two-layered sections of the parietal peritoneum.

The mesentery act to stabilise the position of the organs, stock fat and house blood vessels, nerves and lymph vessels.

Some abdominal organs are found dorsal to the peritoneum and are only partly covered by it (Figure 1).

The duodenum begins after the pylorus and ends at the jejunum. It is approx. 25 cm long.

The small intestine begins at the duodenojejunal junction and loops to the iliocaecal sphincter.

The first part of the small intestine is called the jejunum and is approx. 2.5 m long.

The second part of the small intestine is called the ileum and is approx. 3 to 4 m long.

The colon begins with the caecum (+ appendix), ascending colon, transverse colon, descending colon, sigmoid colon and ends as the rectum. It is shorter than the small intestine (approx. 1.5 m long) but has a greater diameter (Figure 2).

Typical of the colon is a reduction of the longitudinal muscular layer to three bands of smooth muscle (teniae coli).

The base tone results in the haustra: pocket-like folds in the colon.

Fat-filled pockets of peritoneal serosa hang from the colon. Their function is unclear. It has been proposed that they aid the mobility of the colon compared to surrounding structures.
Dorsomedial from the caecum is the appendix, which contains lymphoid tissue.

**Figure 1** - Medio-sagittal view, situation at birth

**Figure 2** - Intestines
The position of the colon is not always strictly as shown in anatomic textbooks and is highly variable (Figure 3).

The most frequent positions are described in the following sections.

Figure 3 - Fluoroscope of the colon
3. Function

3.1. General
The digestive system has 7 base activities:

- **Ingestion**: taking food into the body.

- **Propulsion**: transport of the food through the digestive tract by way of peristalsis.

- **Mechanical digestion**: the physical breaking down of the food from large molecules into smaller pieces. Thereby increasing the surface area of the food so that enzymes can have their effect.

- **Chemical digestion**: this is the enzymatic hydrolysis of nutritional molecules into absorbable substances such as monosaccharides, amino acids and fatty acids.

- **Absorption**: the passage of the end product of the digestion such as vitamins, minerals and water from the intestinal lumen into the blood or lymphatic circulation. The greatest amount of the absorption occurs in the small intestine.

- **Defecation**: is the elimination of indigestible materials as faeces.

- **Immunological activity**: this specific protective and control function of the digestive tract should not be forgotten.
3.2. Propulsion and mechanical Digestion

**Propulsion**: the progression of the intestinal contents through the tract via peristalsis (Figure 45 and 46).

**Mechanical digestion**: is the physical breakdown of the food so that large molecules become smaller. Thereby increasing the surface area of the food so that enzymes can have their effect.

The intestinal contents are massaged as illustrated in figure 45.

![Figure 45 - Massage of the intestinal contents](image)

The propulsion occurs as illustrated in figure 46.

![Figure 46 - Propulsion of the intestinal contents](image)

Peristalsis is a specific pattern of contraction by smooth muscles to propel the food along the digestive system.

It was first described by Bayliss and Starling as motility, which means contraction behind the bolus and relaxation in front of the bolus.
Peristalsis is under intrinsic nervous system control.

This intrinsic system is stimulated by the bolus itself: mechanical stretch and possibly mucosal irritation.

There are two reactions:

1. A group of interneurones activate excitatory motorneurons above the bolus (acetylcholine and substance P stimulate the contraction above the bolus).

2. Another group of interneurons activate inhibitory motorneurons, which relax the smooth muscles behind the bolus. Nitrous oxide, vasoactive intestinal peptide and ATP are the neurotransmitters.

*Figure 47 - Neurological regulation of the peristalsis*
4. Mobility

4.1. General
When referring to the physiological mobility it is actually a passive mobility. In case of a normal mobility the osteopath will be able to mobilise the different parts of the intestines. If this is not the case then a restriction of motion and adhesion is present.

4.2. The Duodenum
The mobility of the duodenum (Figure 52) follows the mobility of the pancreas head.

The mobility of the pancreas under influence of the diaphragm is usually described as being limited, especially if compared to the mobility of the liver, the stomach or the kidneys. This is due to the fixation in the peritoneum.

However, the pancreas does have certain mobility, which is important for normal function. This has only been known since 1980.

The tail of the pancreas has more mobility than the head.

The average movement of the pancreas head under influence of the respiration is 2 cm with a maximum (during deep inhalation) of 4 cm. The duodenum follows these motions.

Studies concerning the mobility of the duodenojejunal junction under influence of the diaphragm do not exist but we can assume that it will be quite restricted due to the attachment into the right crus of the diaphragm via the ligament of Treitz.

![Figure 52 - Mobility of the duodenum](image-url)
4.3. The small Intestine
The small intestine is very mobile around the mesenteric root (Figure 53) and in all directions.

4.4. The Caecum
The caecum is very mobile to medial (1) (Figure 54). If this is not the case an adhesion is present with the iliac fascia. This is a frequent occurrence after appendectomy due to the development of scar tissue.

The caecum is mobile to lateral/right-inferior (2) (Figure 54). This mobility is slightly limited by the relationship with the small intestine and the mesoappendix. If this direction is resistant an adhesion between the medial part of the caecum and the small intestine is present. This sometimes occurs post-appendectomy.

The caecum is also mobile to cranial/right (3). This mobility compresses the caecum into itself. If there is resistance an adhesion with caudal structures can be suspected (Figure 54).
4.5. The ascending Colon

The ascending colon is mobile from dorsolateral to ventromedial (Figure 55 and 56). The range of motion in both directions is about the same.

The ascending colon is also mobile around a craniocaudal axis at the mesentery of the ascending colon.

![Figure 55 - Mobility of the ascending colon in the frontal plane](image1)

![Figure 56 - Mobility of the ascending colon in the horizontal plane](image2)
5. Pathology

5.1. Duodenal Ulcer
If the balance between the volume of gastric acid produced and the protective quality of the mucosal layer in the duodenum is not good, an ulcer can develop (Figure 63).

The direct causes are:

- Infection with helicobacter pylori is the cause in 19 out of 20 cases. The infection occurs in 1 out of 4 people and remains for life. In most cases these bacteria cause no problem. In certain people the bacteria lead to an inflammation of the mucosal layer of the stomach and/or duodenum. The inflammation of the mucosa disrupts the above-mentioned balance and an ulcer develops.
- Non-steroidal anti-inflammatoary medication including aspirin and ibuprofen. Approx. 1 in every 20 ulcers is the result of these medications.
- Other causes are rare such as the Zollinger-Ellison syndrome (more acid production in the stomach).
- Though not causes as such smoking, stress and alcohol will contribute to and worsen the situation.

The symptoms of stomach and/or duodenal ulcers are:

- Inconstant abdominal pain under the sternum is the most common symptom. The pain typically occurs before mealtime and when hungry. Eating eases the pain and antacid tablets also reduce pain.
- Other symptoms are nausea and a feeling of being full after eating. In some cases the pain is worsened with eating.

Possible complications are:

- Bleeding, from a banal grade to life-threatening haemorrhage.
- Perforation of the duodenum allowing food to pass through the duodenum leads to acute pain. This condition is a medical emergency.
- Narrowing and obstruction: swelling and scar tissue can lead to narrowing. These complications are associated with vomiting.
The treatment for a duodenal ulcer due to helicobacter pylori is antibiotics and an acid suppressing medication so that the antibiotics are able to work (Malfertheier et al 2007). The treatment does not provide absolute surety that the bacterial infection will not reoccur.

**Figure 63 - Duodenal ulcer**

### 5.2. Duodenal Atresia
Duodenal atresia is a developmental problem of the duodenum, which can lead to obstruction.

The condition occurs in 1: 10,000 new-borns. One third of cases are associated with Down syndrome.

The symptoms include green vomit due to the bile content. The vomiting continues even if the baby is not fed.

The only solution is surgery.

### 5.3. Meckel’s Diverticulum
Meckel’s diverticulum is a projecting sack (Figure 64) in the small intestine and the most common embryological problem. It is a remnant of an incompletely closed yolk canal.

It is found in the last 60 cm of the small intestine and is 4 to 10 cm long.

It can have a normal intestinal wall surface but in 50% of cases can have a gastric mucosal surface.

Pancreatic, duodenal and colon mucosa surface also can occur.

The diverticula with gastric mucosa lead to most problems (bleeding).

Sometimes a diverticulum with a fibrous band bound to the navel occurs.
Such a diverticulum is found in approx. 2% of the population, more in men than in women (3:1).

It does not always lead to symptoms: in 4.2% of cases symptoms do occur.

Complaints will then occur before the age of 2 yrs. In 20% of cases is this diverticulitis, in 40% of cases obstruction. Bleeding is often associated.

The clinical differential diagnosis with appendicitis is not always easy.

Figure 64 - Meckel’s diverticulum

5.4. Crohn’s Disease or regional Enteritis

Crohn’s disease is a chronic, recurrent granulomatous inflammatory condition (Figure 65).

It can occur anywhere in the digestive tract but occurs most frequently in the terminal ileum. It is also common in the colon.

Sometimes the duodenum can be involved.

Pain in the right iliac fossa and bleeding are the typical symptoms.

Fistulisation and obstruction can occur due to scarring form the frequent inflammation.

Numerous studies show that patients with Crohn’s disease consume more sugars than average.

These patients also consume more mono and polyunsaturated fatty acids as well as vitamin B6 than average. These foodstuffs therefore also seem to increase the risk of Crohn’s disease.
6. Symptoms

6.1. Dyspepsia
The term dyspepsia is used to describe a group of symptoms such as subdiaphragmal pain, nausea, ructus (burping), burning and retrosternal pain. Mostly dyspepsia is functional (no findings with endoscopy).

Next to malignancy the most frequent structural causes are gastritis, duodenitis, hiatus hernia, oesophagitis and duodenal ulcer.

6.2. The ileocaecal Sphincter Syndrome

6.2.1. Open iliocaecal Sphincter
In this case a backflow of colon content into the small intestine occurs.

This condition causes diarrhoea.

6.2.2. Closed iliocaecal Sphincter (Spasm)
In this case the intestinal content is not transported into the colon.

This condition causes constipation.

The symptoms of an open or a closed sphincter can resemble each other.

Many symptoms result from the absorption of toxic products, produced in the small intestine and then ‘sent back’ by the colon. At that moment the lungs and the skin must takeover part of the elimination process. This results in smelly breath and a strong body odour.

An open sphincter will often result in the combination of dehydration and fluid retention. This retention is a normal reaction if too many toxins are in the circulation: the fluid dilutes the toxins. In serious cases this occurs in combination with liver conditions.

Frequent symptoms with both conditions are:

- Heart palpitations.
- Thorax pain with physical effort.
- Migraine.
- Oedema.
- Right shoulder pain often with bursitis.
• Neck stiffness.
• Dizziness, tinnitus, nausea, fainting.
• Sinusitis.
• Sudden thirst.
• Dark rings around the eyes (very frequent).
• Itchiness (very frequent).

A closed sphincter will often show symptoms in the morning and will improve with activity. If the patient becomes active, the headache and other symptoms will improve. The symptoms worsen in rest and when falling asleep.

Some food can worsen the symptoms. Starch and most importantly gluten seem to be the most irritant. However, before a gluten free diet is prescribed the function of the iliocaecal sphincter must be corrected.

In the case of an open sphincter the small intestine is often too alkaline and in the case of a closed sphincter too acidic.

The maintenance of the acid-base balance via the diet can be essential. Digestive enzymes are also an important help.

**Emotional factors:**

Internalised emotions increase sympathetic stress and can contribute to a closed sphincter.

Abnormally extrovert patients often have an open sphincter.

In cases of both closed and open sphincters a palpation of the sphincter will be painful. Often the pain will be epigastric and local.

Lower back pain is frequently associated with a sphincter problem. Research shows that in more than 80% of lower back pain palpation of the iliocaecal sphincter is painful (*Bablis et al 2006*).

70 to 80% of the western population show contamination of the small intestine and some authors attribute this to how we go to the toilet (porcelain toilet). If, while sitting on a normal western toilet, abdominal pressure is increased a reflux of colon to small intestine occurs.

This does not occur if crouching (*Figure 74*). Therefore the advice is given when going to the toilet on a western toilet to use the hand to press in the right iliac fossa to push the caecal contents upwards and stop any reflux. The appendix is also unloaded.
6.3. Irritable Bowl Syndrome (IBS)
(Francis 1994)

This condition is characterised by the following combination of symptoms:

- Abdominal pain, which subsides with defecation.
- The pain begins together with a change in toilet habits and in the faeces itself.
- Often an alternating cycle of diarrhoea and constipation.

The aetiology of the condition is unknown but certain factors do play a role:

- Visceral hypersensitivity caused by dysfunction from the central nervous system.
- Visceral hypersensitivity becomes obvious when the patient has abnormal pain during rectal distension.
- Emotional trauma can play a role, most importantly childhood trauma.
- Stress worsens complaint.
- The autonomic nervous system of the intestinal system may also be involved. In IBS patients a cellular immune dysfunction has been shown. The intestinal mucosa has an increased number of mast cells.
- Rectal manometry in these patients shows a lowered contractility.
- Patients with IBS also show irregular action potentials.
7. Clinical Examination

7.1. Observation

7.1.1. Standing Observation of the Abdomen
With the patient standing, the line between xyphoid process – pubis is observed (Figure 77).

![Figure 77 - Standing observation](image-url)
7.1.2. Observation of the Abdomen, Patient Supine

With the patient supine the line between xyphoid – pubis is observed (Figure 78).

Figure 78 - Observation, patient supine (lateral view)

Normal

Congestion of the upper digestive system

Total intestinal congestion

Uterusptosis

Total intestinal atonia

Video 1 - Observation, patient supine
7.1.3. Observation of the Abdomen, Patient Supine

With the patient supine the line between navel and ASIS is observed (Figure 79)

*Figure 79 - Observation of the line between navel – ASIS (from caudal)*

*Video 2 - Observation of the line between navel – ASIS*
8. Osteopathic Techniques

8.1. Mobilisations and drainage Techniques

8.1.1. Stretch of the lesser Omentum
The patient is supine, both knees bent.

Both thumbs are placed under the right dome of the diaphragm and a dorsal pressure against the lesser omentum is applied.

It is then stretched caudally.

8.1.2. Stretch of the vertical Part of the Duodenum
The patient is supine, the knees bent or straight.

The osteopath grips around the duodenum II between thumbs and fingers.

The mobilisation is to lateral/right and in length direction (cranio-caudal).
8.1.3. Stretch of the first Part of the Duodenum
The patient is supine, the knees bent or straight.

The duodenum I is palpated between the pylorus and the edge of the 10th rib, on a line to the right shoulder.

The duodenum I is stretched in the length direction.

Video 41 - Stretch of the vertical part of the duodenum

Video 42 - Stretch of the first part of the duodenum
10. About the Authors

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Both authors are holders of university degrees, namely the Master of Science in Osteopathy – University of Applied Sciences, and are very active with the promotion and academic structuring of osteopathy in Europe. In 1987 they began The International Academy of Osteopathy (IAO) and are, to this day, the joint-principals of this academy. The IAO is since several years the largest teaching institute for osteopathy in Europe. Both osteopaths are members of diverse professional organisations, including the American Academy of Osteopathy (AAO), the International Osteopathic Alliance (IOA), the World Osteopathic Health Organisation (WOHO), as part of their mission to improve osteopathic development.

This osteopathic encyclopaedia aims to demonstrate the concept that a proper osteopathic examination and treatment is based upon the integration of all body systems.
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