HABITUAL INTENTIONAL FOREIGN BODY INGESTION –
A LITERATURE REVIEW

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Foreign body ingestion is a commonly reported clinical problem. There are no data to evaluate the prevalence of this phenomenon in Poland. In the United States the annual death rate due to foreign body ingestion is estimated at up to 1500-2700 (1). In 80% of cases foreign body ingestion is unintentional and reported in children (2). Among adults unintentional foreign body ingestion is reported most commonly in the elderly and alcohol-dependent patients (3). Some literature indicates that intentional foreign body ingestion among adults accounts for only 10% of all cases (4), there are however studies suggesting that intentional foreign body ingestion accounts for up to 92% of all cases of foreign body ingestion (5). Multiple retrospective studies confirm consistently that intentional foreign body ingestions are most commonly reported in patients with psychiatric disorders, mental impairment and in prison inmates (4-7).

Considering all cases together, the majority of foreign bodies pass spontaneously, 10-20% require endoscopic intervention and only 1% are removed surgically (3). Intentional foreign body ingestion is associated with much more severe consequences, which require emergency medical intervention in up to 76% of patients and surgery in 28% of patients (8).

Foreign body ingestion management depends on the characteristics of the ingested foreign body, such as: size, shape, presence of sharp edges, its location, time from ingestion, severity of clinical symptoms and development of potential complications (5). On the other hand the material the foreign body is made of determines the usefulness of diagnostic techniques (9, 10).

This literature review presents the extent of intentional foreign body ingestion with regard to risk group characteristics, usefulness of imaging diagnostics, management options and prevention of recurrence.

Characteristics of patients

This problem is most commonly reported in patients with psychiatric disorders, mental impairment and prison inmates (4-7). The results of retrospective studies in the US which analysed intentional ingestion of various foreign bodies have determined the pre-existing, known psychiatric disorders in 79-85% of patients in this patient group (4, 5). Intentional ingestion of foreign bodies is associated with psychiatric disorders such as: malingering (Münchausen’s syndrome), psychotic state, pica, obsessive-compulsive disorders or personality disorders (4, 11, 12).

The most commonly reported disorder is malingering – 69.9% (13), i.e. fabricating the symptoms of the disease for “secondary gain” motives (14). This behaviour is typically reported in prison inmates and institutionalized psychiatric hospital patients with the intent to change the environment to a more comfortable one by transferring to the hospital department (4). The ingested foreign bodies are often selected to exclude patient treatment in the treatment department and to require emer-
Among 542 patients analysed by Veltichkov et al. patients with psychotic disorders accounted for 22.9% (13). The patients ingested various foreign bodies as a result of delusions and hallucinations. In these patients attention was drawn to a significant number of ingested foreign bodies and their symbolic meaning, many times associated with the delusions (12).

Whereas pica (depraved appetite) is a disorder characterized by eating non-food materials or other, non-processed ingredients, such as flour or raw potatoes (16). This pathological behaviour is more often reported in children with developmental disorders, including autism spectrum disorders (the symptom may persist into adulthood). The incidence in patients in social care institutions ranges from 21.8% to 25.8% (17, 18). Multiple studies suggest including pica in the spectrum of obsessive-compulsive spectrum disorders due to similar neurobiology and response to selective serotonin reuptake inhibitors (SSRI) (19, 20).

Intentional ingestion of foreign bodies may be classified as Non-Suicidal Self-Injury (NSSI), which is defined as deliberate, self-inflicted destruction of body tissue resulting in immediate damage, without suicidal intent and for purposes not culturally sanctioned (contrary to e.g. tattoos or piercing) (21). Due to significance and consequences of this problem, NSSIs have been included as conditions for further study in the latest version of “Diagnostic and Statistical Manual of Mental Disorders-V” (22). NSSI behaviours are one of potential manifestations of personality disorders. These are reported most commonly in patients with emotionally labile (“borderline”) personality disorder which is distinguished among other disorders by high rate of auto-aggressive behaviours (14). The patients in this group often have a history of child neglect and psychical/physical abuse or sexual harassment during childhood (23). Destructive behaviours become for them a way of dealing with aggressive (often non-conscious) emotions towards themselves and others. During hospitalization or incarceration the patients/inmates are subjected to control and forced to comply with norms and procedures. The ingestion of a foreign body gives them a sense of control, because everyone else must conform to the arising situation (11).

Intentional habitual foreign body ingestion is commonly reported in prison inmates. In this patient group particularly characteristic is the ingestion, in subsequent recurrences, increasingly larger and more dangerous objects (24). The actions of these patients are most commonly motivated by the earlier mentioned secondary gains (4). Many of these patients have a pre-existing known psychiatric diagnosis, which alike male sex, is an additional predictive factor for recurrence (25).

Typical symptoms and management

The majority of ingested foreign bodies pass spontaneously without complications (3). In the remaining cases the foreign bodies are stuck in locations of anatomical (cardia, pylorus, duodenal curve, ileocolic valve, anal canal) or pathological (postoperative adhesions, pathological lesion of the intestinal wall, diverticula) stenosis. Type, character and severity of symptoms depend on the location of the foreign body and developing complications, which most commonly include: perforation, obstruction (fig. 1) or gastrointestinal bleeding (2, 3). Literature data indicate that less than 1% of ingested foreign bodies result in perforation of the gastrointestinal wall in the short-term (13). This usually occurs in the ileocolic valve and sigmoid area (26) and depends

![Fig. 1. Fluid levels in the course of gastrointestinal tract obstruction as a result of ingestion of non-metallic foreign bodies. X-ray scan with horizontal beam, female patient in left decubitus position](image-url)
largely on the length, tips and presence of sharp edges of the foreign body (27). According to literature data the mean time from ingestion to perforation is approx. 10 days (28). Whereas objects remaining in the gastrointestinal tract for more than 3-4 weeks become covered with fibrin, thus closely adhere to the mucosa leading to a gradual perforation of the intestinal wall and development of a fistula. This condition enables the extraluminal migration of ingested objects, often into non-typical sites, such as: femoral joint, urinary bladder or free peritoneal cavity (29). The most commonly patient-reported symptoms directly following the foreign body ingestion are presented in fig. 2.

As mentioned earlier, the type of symptoms depends on the location of the foreign body (tab. 1). In the case of a foreign body located in the oesophagus the most typical symptoms include pain, difficulty swallowing, choking, sialosis, dyspnoea, dysphonia, vocal cord paralysis, cough and aspiration with food (30, 31). In such cases endoscopy is the primary diagnostic-therapeutic tool, and the indications for its urgent use include a complete obstruction of the oesophagus, ingestion of a sharp object or a battery (32).

In the case of difficulties in the passage of the pylorus, the object stuck for 4-5 days may result in injury of the stomach mucosa, manifested by epigastric pain, loss of appetite and coffee-ground vomiting (33). Endoscopy is required in patients, in whom lack of foreign body passage is observed for 3-4 weeks and patients who ingested sharp-edged objects or blunt-edged objects above 6 cm in length and 2.5 cm in diameter (32). The management, depending on the location and type of the foreign body is presented in tab. 2.

Location of the foreign body in the stomach, duodenum or the large intestine may progress with a mild intensity of symptoms or even asymptotically with inflammatory parameters within the normal range and the only persistent condition may be an increased body temperature above 37°C (29). Diversity in terms of dynamics of symptoms development and severity is explained by: anatomic structure of the gastrointestinal wall (such as the stomach), anatomic location (duodenum) or protective role of the greater omentum (in relation to the large intestine).

Symptoms of perforation due to foreign body in the small intestine are usually characterized by a more dynamic (< 3 days) and a more severe course (34). They are however not very specific, often mimicking the symptoms of e.g. appendicitis or diverticulitis (29). In the case of a foreign body in the small intestine daily X-ray monitoring (passage) is recommended, usually preceded by a plain abdominal X-ray (35). Appendicitis, perforation or periappendicular abscess, as a complication due to foreign body is a rare, however occurring cause of pain complaint, altogether producing an “acute abdomen” (36). Stool softeners, laxatives and special diets have not been shown to be beneficial in passing of foreign bodies (35).

Diagnostic imaging

When analysing diagnostic methods which allow for identification and location of foreign

![Fig. 2. The most common early symptoms following foreign body ingestion (5)](image-url)
bodies it should be highlighted that a detailed environmentally oriented medical history, interview and physical examination and then planning an appropriate imaging examination are crucial. Any case of suspected foreign body ingestion requires an anteroposterior and lateral X-ray of the neck and chest and a plain abdominal X-ray in erect position, lying position and the horizontal ray left lateral decubitus position (37). If unequivocal diagnosis is lacking, imaging examination with iodine-based contrast agent is recommended. The use of barium sulphate contrast agent is recommended only if imaging with iodine-based contrast agent failed, however according to ESGE (European Society of Gastrointestinal Endoscopy) foreign bodies not visible on routine X-ray should not be diagnosed with barium-based contrast agents, because this has been associated with the risk of pulmonary aspiration of the chemical substance and worsening of potential endoscopic visualization (38).

An accurate determination of the location and shape of the foreign body, besides the patient’s condition and presenting symptoms, are the basis for choosing optimum therapeutic approach (fig. 3) (tab. 2). Therefore the detection of the foreign body depends on its dimensions, shape, location and the material the foreign body is made of X-ray pictures allow for identification of most of the foreign bodies ingested by patients (fig. 4) (39). However foreign bodies, such as fish bones, bones, wood and plastic are X-ray translucent (40); in such cases computed tomography compared to X-ray and ultrasound examination

<table>
<thead>
<tr>
<th>Type of foreign body</th>
<th>Location</th>
<th>Management</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Batteries</td>
<td>Oesophagus</td>
<td>Urgent removal by endoscopy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stomach, duodenum</td>
<td>&gt;2 cm → removal by endoscopy</td>
<td>X-ray every 3-4 days</td>
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<td></td>
<td></td>
<td>&gt;48 h without progress → removal by endoscopy</td>
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</tr>
<tr>
<td></td>
<td>Below the ligament of Treitz</td>
<td>No progress, symptoms, beyond the range of</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>endoscope → removal by surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symptoms of obstruction/bleeding/perforation → urgent removal by endoscopy/laparotomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sharp objects</td>
<td>Oesophagus</td>
<td>Urgent removal by endoscopy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stomach, duodenum</td>
<td>Urgent removal by endoscopy</td>
<td>X-ray every 24 h for 3 days</td>
</tr>
<tr>
<td></td>
<td>Below the ligament of Treitz</td>
<td>No progress for &gt;72 h → laparotomy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symptoms of obstruction/bleeding/perforation → laparotomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blunt objects</td>
<td>Oesophagus</td>
<td>Removal by endoscopy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stomach, duodenum</td>
<td>&lt;2 cm → conservative treatment</td>
<td>X-ray every 7 days for 1-2 months</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No progress for &gt; 3-4 weeks → removal by</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>endoscopy</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>&gt;6 cm in length and/or &gt;2.5 cm in diameter → removal by endoscopy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Below the ligament of Treitz</td>
<td>No progress &gt; 7 days → removal by surgery</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Symptoms of obstruction/bleeding/perforation → urgent removal by endoscopy/laparotomy</td>
<td></td>
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</tbody>
</table>
produces the best results in the detection of non-metallic foreign bodies deeply located in the body. In some cases however also computed tomography fails, particularly when the foreign body is located in the muscular tissue or between the muscular and the osseous tissue (9).

Perforation is the most severe complication of a foreign body in the gastrointestinal tract. Correct location of the perforation is essential for determination of appropriate management. An X-ray picture typically associated with perforation of the gastrointestinal tract is the presence of free air under the diaphragm. It should be highlighted that this picture is observed only in 15.9% of patients with perforation due to foreign body and results from slow dynamics of the process due to the fact that the site of perforation is enclosed by fibrin, greater omentum or intestinal loop, which significantly reduces the air flow to the peritoneal cavity (34).

Test sensitivity with regard to free air under the diaphragm ranges from 50% to 70% (35). According to literature data oral or per rectum (depending on the location of the foreign body) administration of iodine-based contrast agent should be considered (41) to confirm the presence of perforation by imaging the extraluminal leakage of the contrast agent.

Computed tomography is a more sensitive method compared to X-ray. CT enables the visualization of such an amount of free air which is too small to be observed in the radiograph. Despite the application of computed tomography, free air in the perforation of the small intestine is visualized only in 50% of cases. In order to increase the detection sensitivity of free air, the computed tomography scan should be evaluated in the „wide window setting function”, which allows the distinction between air and the adipose tissue (35). Another advantage of the computed tomography is the improved visualization of intestinal wall rupture, obstruction level and intestinal wall thickening due to inflammatory infiltration or developing abscess (42). Computed tomography with a radioactive marker is helpful in detection and location of the non-metallic foreign body by contrast agent loss (35) and allows for visualization of gastrointestinal wall perforation with a characteristic image of the extraluminal contrast agent leakage. If symptoms of acute abdomen are lacking, several computed tomography scans are recommended with an oral contrast agent. Perforation should be suspected when persistent or gradually increasing amount of free air or a leakage of the contrast agent through the intestinal wall are observed (43). Interpretation of a computed tomography scan depending on perforation site (tab. 3).

Prevention of recurrence

Prevention of recurrence of foreign body ingestion should be focused on the identification of the underlying causes of this behaviour and application of appropriate therapy. A precise psychiatric history is essential for making a correct diagnosis (12).

In the case of a simulating patient, e.g. prison inmate whose motivation is to avoid incarceration, the optimum management includes prompt discharge from the hospital to reduce secondary gains of the self-induced disease (5, 6, 44). Otherwise the patient will reach his/her goal, and this behaviour will be reinforced. Limitation of access to potentially dangerous objects seems to be effective in terms of prevention (44), however difficult to implement in practice.

Patients ingesting foreign bodies in the course of psychosis (most commonly associated with schizophrenia) may be treated with both typical (e.g. haloperidol), as well as atypical (e.g. aripiprazole) antipsychotics (45, 46). Psy-
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Table 3. Interpretation of a computed tomography scan depending on perforation site (35)

<table>
<thead>
<tr>
<th>Perforation site</th>
<th>Typical CT scan</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach, duodenum Duodenal bulb</td>
<td>Large amount of free intraperitoneal air, usually in the liver, stomach and lesser omentum area. Extraluminal contrast agent leakage. Free air located in the round ligament of the liver.</td>
<td>Computed tomography useful in distinguishing haematoma from duodenal perforation.</td>
</tr>
<tr>
<td>Small intestine</td>
<td>Very small amount or lack of free air.</td>
<td></td>
</tr>
<tr>
<td>Large intestine, Small intestine</td>
<td>Free air between mesenteric folds.</td>
<td>Similar image is possible in the case of stomach perforation. Free air in computed tomography image typically during the first postoperative week. Perforation should be suspected when persistent or gradual increasing of free air is observed in CT scan.</td>
</tr>
<tr>
<td>Appendix</td>
<td>Calcification, free air, abscess, phlegmon, wall thickening, inflammatory infiltration.</td>
<td>Very small amount of free air (1-2 ml).</td>
</tr>
<tr>
<td>Sigmoid colon</td>
<td>Extraluminal leakage of faecal mass producing a characteristic image of a spotted mass.</td>
<td></td>
</tr>
<tr>
<td>Perforation of any retroperitoneal site in the gastrointestinal tract:</td>
<td>Retropneumoperitoneum, free air usually in the prerenal area.</td>
<td>Free air in the retroperitoneal space does not spread freely and remains within the area where it has been produced.</td>
</tr>
<tr>
<td>Rectum</td>
<td>Free air usually spreads bilaterally into the anterior and/or posterior perirenal spaces.</td>
<td></td>
</tr>
<tr>
<td>Descending and horizontal duodenum Ascending and descending duodenum Sigmoid colon</td>
<td>Free air is usually located unilaterally and does not extend beyond the midline. Free air in: – right prerenal space indicates to perforation of the duodenum or the ascending part of the colon, – left prerenal space indicates to perforation of the descending part of the colon or sigmoid colon.</td>
<td>The air from intraperitoneal space may also spread into the extraperitoneal space and vice versa. The presence of free air in both spaces suggest an extraperitoneal location of the perforation. The image may be also present without gastrointestinal tract perforation, e.g. in the case of pneumatosis cystoides intestinals and in result of air passage from the chest in the case of mediastinal emphysema.</td>
</tr>
<tr>
<td>Perforation of any intraperitoneal site in the gastrointestinal tract.</td>
<td>Intraperitoneal emphysema</td>
<td>Potentially due to air from the chest or female reproductive tract.</td>
</tr>
</tbody>
</table>

choeducation also plays a significant role and allows the patients to understand their disease and identify their own symptoms upon recurrence.

As mentioned earlier, there are many circumstances supporting the fact that pica may be a manifestation of obsessive-compulsive disorders (OCD). Literature data confirm that application of cognitive-behavioural psychotherapy and pharmacotherapy with SSRI such as: escitalopram, fluvoxamine, fluoxetine, paroxetine or sertralin (recommended in OCD therapy) is beneficial in the treatment of pica (19, 20).

Control of objects in the patient’s surroundings seems to be effective in the prevention of self-injury (NSSI), such as skin cutting or burning, however it is virtually impossible in the case of objects which may be potentially ingested (11). Reduction of recurrences was achieved by application of cognitive-behavioural psychotherapy and dialectical behaviour therapy (47). Other studies confirm the usefulness of naltrexone and clonidine in reducing tendencies towards auto-aggressive behaviour (48, 49). However there have been no reported cases of their use in patients who intentionally ingested foreign bodies.
Conclusions

The highest risk groups for habitual intentional foreign bodies ingestion include patients with international psychiatric disorders, mental impairment and prison inmates. Computed tomography is a recommended diagnostic imaging method when foreign body ingestion is suspected. Medical history and repeated physical examination allow for making an optimal therapeutic decision, irrespective of the primary cause of "acute abdomen".

In the case of ingestion of a sharp-edged object its immediate removal by endoscopy is recommended if the object is located in the oesophagus, stomach or duodenum. Foreign bodies located below the ligament of Treitz require a conservative X-ray monitoring, which duration depends on the physical characteristics of the object. Elective laparotomy is necessary when the foreign body does not progress towards the distal part of the gastrointestinal tract is lacking and emergency laparotomy is necessary when symptoms of peritonitis develop. The best results in patients with habitual ingestion of foreign bodies may be achieved through a close collaboration within the team comprising: nursing staff, surgeon, radiologist and psychiatrist. Identification and treatment of the psychiatric cause of habitual foreign body ingestion is essential for effective prevention of recurrence.

List of abbreviations:

- **SSRI** – Selective Serotonin Reuptake Inhibitors
- **NSSI** – Non-Suicidal Self-Injury
- **ESGE** – European Society of Gastrointestinal Endoscopy
- **OCD** – Obsessive-Compulsive Disorder

REFERENCES

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