Semiological characters and morphopathological–radiological correlations in duodenal malignancy

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Abstract
Localized duodenal neoplasms are relatively rare entities, most often representing invasions of the duodenum by malignant masses developed in the duodeno-pancreatic region. The paper makes a more exact analysis of radiological semiology of duodenal localized tumors and seeks to determine through this analysis the role of radiological examinations in the support for the anatomo-pathologist. The study group included 17 cases of duodenal localized tumors, nine cases of which have been shown to be vaterian ampulloma and eight malignant tumors of the duodenum. All cases were CT (computed tomography) examined and two-thirds were performed conventional radiological examinations, prior to CT examination. Pre-operatively, all cases were evaluated endoscopically, and in three of them bile prostheses were made. CT examination protocol included a native acquisition and post-administration of intravenous contrast agent in both the arterial phase and in parenchymal and venous phase. The acquisition was made with 3 mm thin sections, subsequently coronal and sagittal plane reconstructions being made. The paper tries to establish possible correlations between the morphopathological aspect and the radio-imaging semiological characteristics of lesions.

Keywords: conventional radiological semiology, computed tomography semiology, duodenal tumors, vaterian ampulloma, duodenum.

Introduction
Duodenal tumors in general and malignant tumors in particular are regarded by the whole professional literature to be rare. It is considered that they account for only 5% of all tumors of the digestive tract.

By definition, the malignant duodenal tumor excludes the Vater ampullar malignancies, as well as secondary involvement of the duodenum in the context of a vicinity cancer. Basically, intraoperatively, the duodenal malignant lesion can have an extension through which the Vater ampulla is included in the tumor mass [1, 2]. Similarly, the vaterian ampulloma extends, invading the duodenal neighboring wall. Because of this, the paper includes both primitive duodenal malignancies and vaterian ampulloma [3–6].

Analyzing the semiological characteristics of these lesions, it is noted that a careful study of these changes can focus the diagnosis on one or the other of the two types of cancer; the size, the level of extension, the enhancement may be useful information for the anatomo-pathologist, who is faced with a piece from which they must conclude the real diagnosis.

Malignant tumors can grow from any of the histological elements that are part of the duodenal wall. Therefore, primitive duodenal neoplasms are classified in tumors with origin in endoblast, represented by epithelial tumors and adenocarcinomas, and tumors of mesoblastic origin that have the generic name of sarcomas. A separate entity is represented by the primitive duodenal lymphoma [6, 7].

A number of authors consider that duodenal adenocarcinomas are histologically well-differentiated carcinomas. Frequently, it was identified the presence of mucin-producing columnar epithelium. The most reliable ways of dissemination are considered to be the lymphatic pathway to the regional lymph nodes and the portal vein to the liver. Often the dissemination by contiguity caused the emergence of peritoneal metastasis, as well as the invasion of various neighboring organs, most often involving the pancreas due to its position to the duodenum.

The lining of the Vater papilla represents a complex set of folds of the mucous membrane, which acts as an anti-reflux valve and participates in regulating the flow in pancreatic and biliary secretion. The constitutive smooth muscles of the Oddi sphincter differ both anatomically and especially embryologically from the parietal duodenal...
malignant, with histopathological confirmation; by instilling the duodenum through the probe, with suspension was introduced. The double contrast was obtained by aspiration of the duodenum, 30–50 mL of barium sulfate being positioned fluoroscopically inserted through the nasal or oral pathway, the distal extremity of the probe being fluoroscopically inserted. Eleven patients underwent radiological gastro-duodenography.

Of the 11 patients, eight of them have had double-contrast examination, and the other hypotonic duodenography. The variations of the implantation manner in the papilla of the common bile duct and pancreatic one, simultaneously determine different ways of surgical approach of malignancies of this region. Avisse et al. [9] even consider that these neoplasms can be separated into cancerous entities of bile duct origin and pancreatic ductal cancers.

The purpose of this paper is to determine potential semiological, radiological and imaging characters that will allow a differential diagnosis between the duodenal adenocarcinoma and vaterian ampulloma, considering that the surgical therapy, as well as the survival rate in patients, are different [10–13].

Patients and Methods

A total of 17 cases have been studied, which included patients diagnosed and operated for cancer with duodenal location. Of these, nine were neoplasms of the ampulla of Vater, and eight cases were duodenal adenocarcinomas.

In the cases selection, which extended over a period of three years, from 2011 until 2014, the following selection criteria were considered:

- Patient age: between 30 and 60 years;
- Diagnosis: cancer patients with duodenal localization;
- All patients were evaluated endoscopically;
- The tumor with duodenal localization to be clearly malignant, with histopathological confirmation;
- The malignant tumor to be located in the descending duodenum.

All had undergone preoperative CT (computed tomography) examination, native and with intravenous contrast material. Eleven patients underwent radiological gastro-duodenal examination. Of the 11 patients, eight of them have had double-contrast examination, and the other hypotonic duodenography.

The conventional radiological examination was performed on Siemens equipment – Iconos.

For the duodenography, an enteral probe was used, inserted through the nasal or oral pathway, the distal extremity of the probe being positioned fluoroscopically in the first half of the descending duodenum. After the aspiration of the duodenum, 30–50 mL of barium sulfate suspension was introduced. The double contrast was obtained by instilling the duodenum through the probe, with about 80–100 cm³ of air, gradually, under fluoroscopy. Imaging series were performed in incidents selected in a way that would highlight the lesion in the best way possible.

For the hypotonic duodenography, Scobutil was used, administered intravenously about 30 minutes prior to the examination. The contrast material was administered also through the enteral probe and gradual air insufflation was performed.

The analysis of the radiological changes in conventional radiological examinations included only morphological changes, considering that all patients have been given an antispasmodic, which excluded the analysis of any functional changes. It was analyzed the presence of lacuna, the existence of a possible stenosis, the presence of ulceration, mucosal folds changes, the possible existence of rigidity.

The CT examination was performed on a Siemens Emotion Duo device with 3 mm sections, contiguous, and MIP (maximum intensity pixel) reconstructions in sagittal oblique, coronal and oblique coronal.

For studying the duodenum, in fact the entire upper abdominal floor, the CT scan was preceded by ingestion of about 500 mL of iodinated contrast agents, hydro-soluble, 2–3% diluted with water, about 5–10 minutes before ingestion. In patients in whom the CT examination was subsequent to the endoscopic examination, Scobutil was intravenously administered 30 minutes prior to the examination. The acquisition in arterial phase and venous phase was performed with the patient supine and subsequently was performed an acquisition of the same region with the patient in right lateral decubitus position.

Were analyzed the duodenal wall thickness, the enhancement of tumor and its characteristics, the presence of an interface of demarcation between the tumor and the vicinity organs, the status of the periduodenal area, the existence of lymph nodes and the analysis of possible morphological changes of the bile ducts, gallbladder, neighboring organs.

The result of the imaging examination was confronted with the surgical protocol and the histopathological examination, trying to find correlations between the histopathological staging form, tumor size, the loco-regional extension, the level of lymph node invasion – CT determined, with the morphopathological aspect and the histopathological characters of the tumor.

Results

Considering the selection criteria in setting up the study group, from the total of 17 cases of tumors with duodenal localization, the gender distribution of the studied cases was 12 cases of male patients, the remaining five cases being female patients. Expressed as a percentage, the gender distribution of the cases studied is 70.6% men and 29.4% women.

The distribution by age of the study group showed that the highest frequency of occurrence of tumors with duodenal localization, regardless of the patient’s gender, is in the age decades of 41–60 years, with a total of 14 patients, representing a percentage of 82.35%.

Considering the type of tumors with duodenal localization, out of nine cases of vaterian ampulloma, seven cases were within in the age group 41–60 years and two cases in the age group 31–40 years, as a percentage, 77.77% of cases being vaterian ampullomas detected at 41–60 years groups.

Of the eight cases of duodenal adenocarcinomas, seven cases affected age groups 41–60 years, accounting for 87.5%, and one case being placed in the age group 31–40 years.

In terms of analysis of radiological changes found both in conventional radiological examination and especially on CT examination, the results are presented below, considering the importance of the information in the radiological–histological correlation of the studied cases.
Lacuna, from radiological point of view, actually translate the existence of an intraluminal space replacement process corresponding to the CT description – tumor. Morphopathologically, the lesion may affect at least one of the parietal structures of the descending duodenum. The radiological characterization of the lacuna may suggest, through size and contour analysis, the expansion mode of the lesion. Computed tomography, unlike radiological examination, which is more subjective, makes a pertinent analysis of the characteristics of a lacuna.

Of the 11 cases of tumors with localization in the descending duodenum, using a conventional radiological examination, the existence of lacuna was seen in all patients examined. In an attempt to standardize interpretation of the conventional radiological image, absolutely necessary to the study, and to allow a differentiation from filling defects due to thickening of folds, we considered as a lacuna any defect filling with a minimum diameter of 1 cm. We sorted the group of cases of lacunae in three subgroups: 1–2 cm, 2–4 cm and over 4 cm.

Given this classification, the distribution of the number of cases depending on the size of the lacunae was: in one case the lacuna had a maximum diameter of 2 cm, four cases showed lacunae of 2–4 cm, and one case presented a lacuna with a diameter larger than 4 cm.

The distribution of cases in relation to the size of the lacuna, but also according to the type of tumor with duodenal localization is shown in Table 1.

<table>
<thead>
<tr>
<th>Lacuna size</th>
<th>1–2 cm</th>
<th>2–4 cm</th>
<th>&gt;4 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases of duodenal adenocarcinoma</td>
<td>–</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>No. of cases of vaterian ampulloma</td>
<td>2</td>
<td>2</td>
<td>–</td>
</tr>
</tbody>
</table>

Emphasizing the intraluminal space replacement process in the descending duodenum, in CT examinations of the study group, is the first sign in the orientation of the diagnosis of tumor with duodenal localization. It is detectable from native acquisition during CT examination, but is not a sure sign of malignancy. Therefore, the analysis of its dimensional criterion is presented in Table 2.

<table>
<thead>
<tr>
<th>Lacuna size</th>
<th>1–2 cm</th>
<th>2–4 cm</th>
<th>&gt;4 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases of duodenal adenocarcinoma</td>
<td>2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>No. of cases of vaterian ampulloma</td>
<td>6</td>
<td>3</td>
<td>–</td>
</tr>
</tbody>
</table>

Conventional radiological semiology makes a differential diagnosis between a benign lacuna and a malignant lacuna by analyzing their contours. The irregularity of contour expresses both tumor infiltration, and submucosal inflammatory process caused by tumor development.

Of the 11 cases examined, lacuna contour analysis revealed two types of changes: irregular contour and polycyclic contour. If the irregular contour was found in four cases of duodenal ADK (adenocarcinoma) (Figure 1), the polycyclic contour was found in all cases of vaterian ampulloma (Figure 2) and in a case of duodenal ADK, with a size of 2–4 cm.

In terms of CT examination, the contour irregularity is not a primary analysis criterion in characterizing tumor process. CT allows dimensional analysis of the duodenal wall thickness, which is a more pertinent information in terms of studying the radiological–histopathological correlations of the cases studied, because it represents the degree of parietal duodenal infiltration tumor.

Duodenal wall thickening notion is based on the value estimated as normal duodenal wall. Anatomists assert that bowel wall thickness decreases from duodenum to the ileocecal valve, considering that the allowed average size in duodenum should be about 3 mm, reaching 1 mm to the ileum.

Duodenal wall thickness measured by CT is considered normal at maximum values of 3–4 mm. In this situation, in this study, according to these considerations, we estimated as normal value a maximum size of 4 mm of the duodenal wall.

In terms of parietal thickening degree, the study group was classified into three subgroups, namely: cases with duodenal wall thickness set between 4–6 mm, 6–8 mm and over 8 mm. Of the 17 cases of duodenal localized tumors studied, 11 cases had duodenal wall size between 6–8 mm, four cases had duodenal wall thicker than 8 mm, and in two cases, the duodenal wall had a thickness between 4–6 mm.

Wall thickening was located on the medial side of the descending duodenum in 16 cases; in one case, the duodenal wall being almost circumferentially thickened (Figure 3). Depending on the type of tumor with duodenal localization, the analysis of duodenal wall thickening is represented in Table 3.

<table>
<thead>
<tr>
<th>Duodenal wall thickness</th>
<th>4–6 mm</th>
<th>6–8 mm</th>
<th>&gt;8 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases of duodenal adenocarcinoma</td>
<td>–</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>No. of cases of vaterian ampulloma</td>
<td>7</td>
<td>2</td>
<td>–</td>
</tr>
</tbody>
</table>

Ulceration is a radiological modification corresponding to a parietal duodenal tumor intrusion and was seen only in case of duodenal adenocarcinoma. Conventional radiologically, is seen only in lacuna and not as an associated lesion in descending duodenum (Figure 4). It is about superficial ulcerations, of infracentimetric size, difficult to identify and differentiate on conventional radiological examination, but perfectly highlighted on CT. Of the eight cases of duodenal ADK, six showed ulcerations, being seen both in tumors sized between 2–4 cm and the ones with dimensions above 4 cm.

Rigidity constitutes the radiological modification, which actually indicates the extension of the lesion to the other layers of the duodenal wall. However, this extension can be determined either by the actual neoplastic process, either by the inflammatory reaction that accompanies the tumor.

Of the eight cases of duodenal tumors, in six of them was detected the presence of rigidity, which represents a
75%. This led us to believe that stiffness is a basic radiological modification characteristic, almost pathognomonic, for the presence of specific duodenal malignancy, however, without excluding a neighboring pathological process affecting the duodenum.

Modifications of any kind of mucosal folds constitute an extremely important radiological sign, especially in specific duodenal tumors. Thus, in all eight cases of specific duodenal neoplasia, we encountered modifications of mucus membrane folds, the percentage in this case being 100%.

The most frequently encountered modification is that of ease of the folds, present in five out of eight cases studied, representing 62.5%, but can be determined by the edematous infiltration in case of small lesions localized strictly at mucosal level.

This change is actually the real destruction of the mucosal relief by the tumoral process.

The disorganized folds are in frequency in second place, with a total of four cases, so a 50%. We consider that this change is the result of the presence of space replacement process as well as the neoplastic invasion in the mucosal relief, especially along the circumference of the folds.

 Interruption of folds is present in four cases, representing a rate of 50%, this modification being the direct result of the presence of tumoral process that determined destruction of the duodenal mucosa at the tumor level (Figure 5).

Hypertrophic folds, mainly subsequent to neoplastic invasion both longitudinal and circumferential, are present on two cases in the study group, representing a rate of 25%. This type of change is the only one that is described in benign lesions, being the result of any inflammatory edema or hemorrhage in the submucosa.

Although the tumor originates in the lining of Vater ampulla structures, its location makes the effect on duodenal mucosal folds to be important.

In this study, in the nine cases of neoplasia of the ampulla of Vater, seven have revealed different changes in mucosal folds, representing 77.8% in percentage.

The alignment of the folds extremities on the internal contour of the descending duodenum, may indicate a neoplastic process, either ampullary or of vicinity – pancreas head – but can also be found in case of pancreatitis or perivisceritis, being a non-specific marker (Figure 6). In case of vaterian ampullomas, the folds alignment is done above the papilla.

In analyzing a duodenal localized tumor, the CT scanning requires studying the periduodenal space and the existence of a demarcation interface between the duodenal wall and the anatomical structures of vicinity. In fact, the analysis of these two criteria highlights indirectly both T-staging criterion of the tumor and its locoregional extension. Both criteria provide the anatomopathologist valuable information in the analysis of the samples taken and at the same time require the surgeon to provide the anatomopathologist with samples for analysis other than just the resected tumor.

Anatomically, around the duodenal wall, there is a fatty caseous structure, which determines on the CT scan, the presence of a line, that separates the duodenum from the neighboring organs. We defined the notion of interface as such.

The extension of a specific duodenal tumor with exophytic development, can be made in the periduodenal area and/or neighboring organs, among which the pancreas is concerned. If the detection of a tumor mass affecting the duodenum and periduodenal space allows the extension of the duodenal tumor in the periduodenal space, the existence of a mass simultaneously affecting the duodenum and the pancreas, the duodenum and the visceral surface of the stomach, does not allow the assessment of the starting point of the tumor.

The extension in the periduodenal space, on the present study, was limited to mesenteric fat invasion that we encountered in three from a total of eight cases of specific duodenal tumors, representing a percentage of 37.5%.

Determining the presence of mesenteric fat invasion through radio-imaging examinations, is important for deciding the type of surgical procedure, given that in specific duodenal tumors most often there is an intention to perform a surgical excision with intent to extirpate.

For this reason, we consider assessing the integrity of periduodenal space as absolutely necessary information for the surgical team in establishing the patient’s prognosis and defining the cure typology.

We encountered the contiguous extension to neighboring organs in a number of three cases, i.e., 37.5% of patients diagnosed with specific duodenal tumors.

The pancreas is the elective organ of invasion by contiguity of malignant duodenal tumors, being affected in a proportion of about 70%. This is easily explained because of the extremely close anatomical relationship between the two bodies. At the same time, the existence of duodenal neoplasia extension in the pancreas makes the distinction between a duodenal tumor extended in the pancreas and a pancreatic one to be extremely difficult, and the surgical therapeutic conduct differs in terms of existence or not of intention to extirpate.

In case of ampullary neoplasms contiguous extension, in reality, consisted only of the invasion of the pancreatic cephalic portion, the periduodenal area being normal.

Invasion of the head of the pancreas was detected in a number of two patients, which in terms of percentage is almost 22.2% (Figure 7).

Contrast enhancement in duodenal localized tumors is similar to that of other tumors of the digestive tube. Trying to standardize the degree of iodophilia of duodenal localized tumors, we divided the study group into three subgroups: with minimum iodophilia, moderate iodophilia and high iodophilia.

The distribution of the study group depending on the type of tumor and the degree of iodophilia of the tumoral process is represented in Table 4.

<table>
<thead>
<tr>
<th>Degree of iodophilia</th>
<th>Small</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases of duodenal adenocarcinoma</td>
<td>2</td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td>No. of cases of vaterian ampulloma</td>
<td>6</td>
<td>3</td>
<td>–</td>
</tr>
</tbody>
</table>

Table 4 – Distribution of the number of tumor cases depending on the degree and type of tumor iodophilia
Changes in biliary tract in case of duodenal ADK were found in a small number, only two cases, that showed a moderate dilatation of the common bile duct, whose size did not exceed 1.5 cm. In percentages, the number of cases that presented dilated choledoch is only 25%. Therefore, the echo of duodenal neoplasia on the biliary tract is minimal. It could be a criterion for differential diagnosis with other malignancies, specifically with vaterian ampullomas and the head of the pancreas neoplasms invading the duodenum.

If in specific duodenal neoplasms the damage to biliary tract was limited only to increase of the caliber of the choledoch in two cases, the expansion in these cases being moderate, meaning it did not exceed 1.5 cm, in case of vaterian ampulloma we detected an increase in caliber of biliary tree in all nine cases (Figure 8).

In order to classify the changes in caliber of the biliary tract, we divided the cases into three groups, namely those with a diameter of the choledoch less than 1.5 cm, but over 0.9 cm, those with diameters between 1.5–2 cm and those with a caliber of more than 2 cm.

The distribution of the nine cases of vaterian ampulloma and those of duodenal ADK according to this classification is that resulting in Table 5.

<table>
<thead>
<tr>
<th>Common biliary duct size modifications</th>
<th>No. of cases of duodenal adenocarcinoma</th>
<th>No. of cases of vaterian ampullaoma</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9–1.5 cm</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1.5–2 cm</td>
<td>–</td>
<td>5</td>
</tr>
<tr>
<td>&gt;2 cm</td>
<td>–</td>
<td>3</td>
</tr>
</tbody>
</table>

The existence of an irregular contour, of a specific neoplastic infiltration cannot be considered, given that usually the sphincter of Oddi is an anatomical barrier in the cranial extension of the tumor. Terminal bile duct narrowing associated with its irregular contours is a sign that guides the diagnosis either to a distal cholangiocarcinoma or to case of a common bile duct invasion by a pancreatic neoplasm. This is the reason why the analysis of biliary tract modifications was limited to dimensional assessment.

Due to its anatomical position, the ampullary neoplasm also determines Wirsung duct dilatation. In this study, the modification was found in a number of five of the nine cases of vaterian ampulloma, representing 55.56%.

In no case of duodenal ADK were found changes in the gallbladder.

Of the nine cases of ampullary neoplasms, CT has detected changes in the gallbladder in four cases, which represents a percentage of 44.45%. The types of changes in the gallbladder found in the group of vaterian ampulloma cases are represented in Table 6.

<table>
<thead>
<tr>
<th>Gallbladder modifications</th>
<th>Volume</th>
<th>Wall</th>
<th>Presence of gallstones</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of cases of vaterian ampulloma</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

We also studied the gallbladder modifications, regarding volume, wall and the presence of internal gallstones in the study group (Figure 9).

It can be noted that about half of the vaterian ampulloma cases revealed changes in the gallbladder, but it cannot be specified if they were prior or determined by neoplasia.

Although not a topic debated by the specialty literature, we considered it important, based on comparisons with other types of malignant tumors of the pancreatic-duodenal region.

The presence of loco-regional lymph nodes, which translates the lymphatic extension of a tumoral process, we encountered in only two cases of specific duodenal tumors, which represents 25% from the group of eight cases of duodenal ADK.

Although in the specialty literature adenopathies are described to be potentially present in case of vaterian ampullomas, in this study we have not identified any case of the nine ampullary neoplasms showing adenopathies.
Discussion

The correlative study of semiological characteristics of duodenal ADK and vaterian ampulloma, both radio-imagistic and morphopathological, is not intended to rank one of two methods, radio-imaging or morphopathology. The supremacy of morphopathology and especially histopathology in assessing the actual characteristics of a malignant tumor with duodenal location is indisputable. In this case, we consider that choosing the radio-imaging exploration technique in highlighting the semiological characters of a malignant tumor with duodenal location is equally important.

The analysis of basic radiological modifications found in malignant duodenal tumor determinations allowed an assessment of exploration methods based on the reliability of each in detecting as many semiological elements necessary for the diagnosis. The radiological information that can be obtained in the context of a possible diagnosis of duodenal tumor determination had already been presented. In this context, we will proceed to summarize the radiological diagnosis possibilities of each technique, trying to establish the limits of each.

In this paper, conventional radiological examination revealed, in case of duodenal adenocarcinomas, the presence of lacuna in proportion of 87.5%, while CT scanning revealed the existence of lacuna in 100%. The existence of lacuna actually translates the existence of a tumoral process that develops endoluminal.

Maglinte et al. [14] consider that 75% of duodenal primitive malignant lesions manifest through the presence of a lacuna. In the current radiological semiological concept, the term of lacuna represents a decrease of the duodenal lumen through an endoluminal space replacement process, developed on one of the parietal versants. In fact, Barnes et al. [15] state that the major sign that we encounter in a duodenal neoplasm is the filling defect, which actually also translates through the lacuna.

Solej et al. [16] states that in the diagnosis of specific duodenal tumor located in the descending duodenum, the radiological examination has a reliability ranging between 83 and 92% and the CT scanning of 100%.

Regarding the vaterian ampulloma, both conventional radiological examination and CT scanning detected the presence of tumor at 100% [6, 17, 18].

Regarding the tumor size in specific duodenal adenocarcinomas, conventional radiological examination detected only those with a minimum size of 2 cm, the majority, respectively 85.7%, had a diameter between 2 and 4 cm; the rest of the studied group presented a space replacement process, with a maximum size of over 4 cm. In case of CT exploration were detected tumors ranging in size between 1 and 2 cm, in a proportion of 25%, size between 2 and 4 cm in 62.5%, and a size of over 4 cm in
12.5% of patients. Kreel & Mackintosh [19] state that a double-contrast duodenography, properly executed, has an extremely important role in duodenal tumor detection, with reliability exceeding 85%. Statistical analysis is consistent with the Lachachi et al. study [20].

In case of vaterian ampullomas, they proved to have smaller sizes, not exceeding 4 cm. Radiological examination detected in a 50% proportion both ampullomas with size between 1–2 cm, as well as 2–4 cm. CT revealed double the number of ampullomas, with sizes ranging between 1–2 cm, compared to those with a diameter of 2–4 cm. Semelka et al. [21], following a study conducted over a period of two years, regarding ampullary carcinoma conclude that the dimensions of this type of neoplasia do not exceed 5.5 cm.

These dimensional differences are due particularly to the technical inability to accurately measure a lesion in a conventional radiological examination, in these cases, the dimensions being somewhat larger than the real ones that can be detected on a CT examination [21–24].

Di Giorgio et al. [25] stated that, determining the tumoral size in case of ampullomas is one of the main factors that may determine a five-year survival rate of patients after cephalic duodenopancreatectomy. They also believe that conventional radiological examination is practically sufficient in determining tumor size.

We believe that, given the subjectivity of conventional radiological examination induced by technique, and the quality of the contrast material, CT is the most reliable in the tumor dimensional analysis [26, 27].

Although a tumor with malignant characters, the vaterian ampulla presents, in 100% of cases, polycyclic contours. Regarding duodenal adenocarcinomas, they presented an irregular contour in 14.3% of cases, which, from radiological exploration point of view express a higher aggressiveness of duodenal tumor compared to vaterian ampulla [27–30]. Therefore, we can assert that the presence of an irregular contour suggests a duodenal adenocarcinoma rather than a vaterian ampulla [31, 32].

There are opinions, like that of Darrah & Nolan [33] that considers as pathognomonic for duodenal neoplasia, the presence of lacunae with polypoid contour. This assertion derives from a study by Bosse & Neely [34], which materialized in a radiological semiology breviary of duodenal primitive neoplastic tumors.

It is true that a small neoplastic lesion most often translated through polycyclic contours, but should be considered, as stated by Moss [35], the inflammatory reaction of the tumor periphery, which causes irregular contours.

The changes detected in the folds of mucosa are extremely important in the analysis of neoplasia in the duodeno-pancreatic region. Their analysis is specific to conventional radiological exploration, and includes folds orientation, their size, disappearance and the potential irregularities. Nolan [36] believes that irrespective of the histopathological nature of the duodenal malignant tumor, it is accompanied by changes in mucosal topography. It is considered that the extension of the neoplastic process to the mucosa is achieved initially in horizontal plane, subsequently the lesion extending in depth.

The polymorphism of changes in duodenal mucosal topography in case of specific duodenal neoplasia was also described by Nolan [36]. At the same time, Gutmann [37] and later Solej et al. [16], believe that a higher specificity present the contours irregularities of the mucous membrane folds.

In terms of vaterian ampullomas, changes in orientation and eventually of size in perampullary folds constitute indicative signs associated with those of certainty [38–40].

Trier & Winter [41], studying anatomy, embryology and pathology of the small intestine and colon, place the normal value of the duodenal wall to 3–4 mm.

Our study included cases with infracentimetric parietal thickening. Herlinger et al. [42] consider as a sign of neoplastic certainty the duodenal parietal thickening above 1.5 cm. Also, Gourtsoyiannis & Bays [43] argue that the duodenal adenocarcinoma determines a duodenal parietal thickening usually not exceeding 1.5 cm. The authors do not make a comparative reference to neighboring neoplasms invading the duodenum. Zwaan et al. [44] consider that the normal maximum size of the duodenal wall is 6 mm.

We believe that the lower dimensional limit of neoplastic infiltration the wall thickness above 6 mm. To be specified that the parietal thickening is usually asymmetrical.

The dimensional analysis of the duodenal wall, in our study, does not constitute a characteristic imagistic sign of vaterian ampulla, the parietal thickening being in proportion of 78% of only 4–6 mm.

Semelka et al. [21] concluded that most neoplasms of Vater ampulla are defined by a significant increase in bile duct caliber regarded by him as having a value above 1.5 cm, and that only in a small number of cases, the choledochian dilatation does not exceed 1.5 cm.

In our study, the dilatation of bile ducts in case of vaterian ampulloma exceeded value of 1.5 cm in 89% of the cases, while in specific duodenal tumors, this modification was encountered in only 25% of cases, and the dilatation did not exceed the size of 1.5 cm [45, 46]. The same conclusion results from studies of Allescher [8], and Avissse et al. [9], as well as Talamini et al. [47] and Zissin et al. [48].

Conclusions

Duodenal wall thickening visible through the computed tomography, is higher in duodenal tumors (over 6 mm), while vaterian ampulla determines parietal thickening up to 6 mm, so it becomes an important diagnostic sign in differentiation of the two malignancies. Lacuna, as radiological signs, is non-specific in differential diagnosis between malignant duodenal tumors and vaterian ampulloma. Changes in mucosal folds are diagnostic elements, which, although uncharacteristic, are found in all duodenal malignant tumor determinations and conventional radiological examination is the only technique that can analyze these changes. Occlusion of biliary tract in vaterian ampulloma determines the patient’s presentation to the doctor sooner than those with malignant duodenal
tumors, because the dilatation of biliary tract is specific to vaterian ampulla, but has no susceptibility for tumor size and extension. The pancreas is the elective organ of invasion by contiguity of malignant duodenal tumors, being affected in a proportion of about 70%.

Conflict of interests

The authors declare that they have no conflict of interests.

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Semiological characters and morphopathological–radiological correlations in duodenal malignancy


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