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Imaging Characteristics and Prevalence of Pancreatic Carcinoma in Kosovo During 2011-2015 - Diagnostic Method as Choice

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ABSTRACT

Introduction: Pancreatic cancer is the 10th most common malignancy and the 4th largest cancer killer in adults. **Aim:** The purpose of this paper is to evaluate the number of cases presented with pancreatic carcinoma during the years 2011-2015, our experience of the imaging characteristics of pancreatic carcinoma. We evaluated prevalence of the pancreatic cancers, distant metastases and other local infiltration signs among the total cases of the pancreatic cancers diagnosed in the University Clinical Center of Kosovo, with the aim to compare these research findings to similar studies made in the developed countries. This is a retrospective research study done during the period of 2011-2015. **Materials and Methodology:** This retrospective research study includes 362 patients recently diagnosed with pancreatic cancer, examined in the period of 2011-2015 at the University Clinical Center of Kosovo. The imaging diagnostics are performed with MSCT Sensation 64 Siemens, MSCT Emotion 6 Siemens, and 1.5T MRI Symphony Siemens, biopsy guide with MSCT Sensation 64 Siemens in the Radiologic Clinic of UCCK; while the histopathology diagnostics has been performed in Clinic of Pathology at UCCK and prevalence is taken from the number of cases Reported at the Institute of Oncology Institute of Statistics and NIPH (National Institute of Public Health of Kosovo). **Results**: Out of a total of the 362 patients diagnosed with pancreas cancer, results is female 39.5% (n=143) and male 61.5% (n=219), report M: F (1: 1.6), 286 cases resulted in head and neck 79 % (n=286), 76 cases resulted in body and tail cancers (21%), distant metastases in first imaging modality were found in(n=155) patients 43 %, local infiltration was found in patients: gastric infiltration 15 % (n=54), duodenal and papilla infiltration 26% (n=94), local infiltration spleen 16% (n=57), local infiltration mesentery 43 % (n= 155), dilated biliary tree 34 % (n=123), regional lymph node infiltration 83 % (n= 300). Out of a total of the 362 patients diagnosed with pancreas cancer, 346 cases resulted > 2 cm and 16 cases resulted < 2 cm and with component cystic was 41.2 % (n = 149), solid with component cystic – necrotic 33% (n= 119), solid 25.7% (n= 93). The prevalence is 19.9: 100,000 inhabitants. **Conclusions:** Prevalence of carcinoma of the pancreas for 5 years in Kosovo has proved to be prevalence is 19.9: 100,000 inhabitants. Seventy-four percent (74 %, n= 268) of all cancers are found in Stage III and IV. From an imaging point of view, these cancers were presented in an advanced stage, mainly due to their late clinical symptoms and limited access to imaging methods in our country.

Key words: Pancreatic Cancer, MSCT, MRI, Distant Metastasis, Local Infiltration, Prevalence, UCCK Pristina, Kosovo.

1. INTRODUCTION

Pancreatic cancer is the 10th most common malignancy and the 4th largest cancer killer in adults. Pancreatic cancer is a much feared disease due to its notoriously late presentation, early metastases and poor survival rates. Less than a fifth of patients present with localized, potentially curable tumors and the overall five-year survival rate remains less than 5% (1). The pancreas has dual exocrine and endocrine function. Most pancreatic malignancies are exocrine. Infiltrating ductal adenocarcinomas account for 90% of pancreatic cancers (2).

Incidence: The peak incidence for pancreatic cancer is in the seventh and eighth decades of life. There is no difference in incidence between the sexes (3). Due to poor survival rates, incidence and mortality rates are similar at approximately 9 per 100,000 population per annum (4). Risk factors: The main risk factors are smoking, diet (high BMI, red meat intake, low fruit

and vegetables intake), diabetes and alcohol intake. Chronic and hereditary pancreatitis: chronic pancreatitis is associated with a 5- to 15-fold increase in risk and hereditary pancreatitis with a 50- to 70-fold increase. Family history of pancreatic cancer. Familial cancer syndromes: BRCA1, BRCA2, familial adenomatous polyposis, Peutz-Jeghers syndrome, familial melanoma syndromes, Lynch syndrome, Von Hippel-Lindau syndrome, multiple endocrine neoplasia type 1, Gardner's syndrome. Other medical conditions: inflammatory bowel disease, periodontal disease, peptic ulcer disease. All patients at increased risk of inherited pancreatic cancer should be referred to a specialist center for clinical advice and genetic counseling with appropriate genetic testing. 5-10% of pancreatic cancers are due to genetic alteration (5).

The accurate characterization of pancreatic neoplasm is very important for patient's management. CT and MRI have been become the most important modalities for evaluating pancreatic lesions. Precise diagnosis of pancreatic neoplasm is not always straight forward because they frequently show atypical imaging features and many other diseases may mimic pancreatic adenocarcinoma (6, 7). Pancreatic carcinoma is the fourth leading cause of cancer-related death in Kosovo. Pancreatic neoplasm have always been associated with a poor prognosis due to the late presentation, and hence, advanced stage of the disease at moment of the established diagnosis. Although this trend is gradually on the decline with the awareness of the existence of these disease, better radiologic imaging modalities for diagnosis in our country, diagnosis of this disease is still made in late stages and prognosis of disease is poor (8). Pancreatic carcinoma remains one of the deadliest cancers worldwide, and has a poor, five-year survival rate of 5%. Although complete surgical resection is the only curative therapy for pancreatic cancer, less than 20% of newly-diagnosed patients undergo surgical resection with a curative intent. Due to the lack of early symptoms and the tendency of pancreatic adenocarcinoma to invade adjacent structures or to metastasize at an early stage, many patients with pancreatic cancer already have advanced disease at the time of their diagnosis and, therefore, there is a high mortality rate (9). The estimated lifetime risk of developing pancreatic cancer is about 1 in 71 (1.41%) (10). The disease is rare before age 45 but incidence rises rapidly after that and peaks in the seventh decade of life. The major risk factors include smoking (11), hereditary predisposition to pancreatic cancer itself or to multiple cancers (12) and to a lesser degree, chronic pancreatitis (13). Pancreatic cancer does not exhibit early symptoms and initial symptoms are often nonspecific. Classical presentation of pancreatic cancer is present in only 13-18% of the patients and is often accompanied by purities, alcoholic stools, dark urine and weight loss (14). Abdominal pain is present in 80-85% of patients with locally advanced or advanced disease. Acute pancreatitis and new onset diabetes mellitus can often be the initial presentations of PC (15, 16). In up to 75% of the cases, the tumor is located within pancreatic head mostly sparing the uncinated process. Tumors in the pancreatic head often present early with biliary obstruction. However, tumors in the body and tail can remain asymptomatic till late in disease stage. Imaging techniques currently used for diagnosis and preoperative staging of pancreatic cancer include abdominal ultrasound (US), contrast-en-

hanced computed tomography (CT), magnetic resonance imaging (MRI), MR cholangiopancreatography (MRCP) and invasive imaging modalities like endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS). With the continuing substantial improvements in CT technology, the capacity of MDCT for the detection, diagnosis, and local staging of pancreatic cancer has increased. MDCT is very effective for detecting and staging adenocarcinoma, with a sensitivity of up to 90% for detection and an accuracy of 80%-90% for staging (17, 18). Determination of the extent of vascular involvement is usually made by identifying the extent to which the tumor involves the cross-sectional circumference of a vessel.

2. AIMS

The aim of this paper is to evaluate the number of cases presented with pancreatic carcinoma during the years 2011-2015, our experience of the imaging characteristics of pancreatic carcinoma. We evaluated prevalence of the pancreatic cancers, distant metastases and other local infiltration signs among the total cases of the pancreatic cancers diagnosed in the University Clinical Center of Kosovo, with the aim to compare these research findings to similar studies made in the developed countries. This is a retrospective research study done during the period of 2011-2015.

3. MATERIAL AND METHODS

This retrospective research study includes 362 patients first time diagnosed with pancreatic cancer, examined in the period form 2011-2015 in the Clinic of Radiology at University Clinical Center of Kosovo. Only patients that were first time diagnosed with pancreatic neoplasm were included and evaluated in this research. Abdominal ultrasound, MSCT 64 slice Sensation and MSCT 6 slice Emotion were used for CT examination of patients. MRI images are obtained with MRI 1.5T Symphony and core guide biopsy with CT.

Abdominal ultrasound (US) is widely available, noninvasive, relatively inexpensive imaging modality without contrast associated adverse effects. It is usually performed to rule out choledocholithiasis and look for biliary dilation in patients who present with jaundice and abdominal pain. The real world accuracy of conventional US for diagnosing pancreatic tumors is 50 to 70%. The results of US are highly operator dependent. Computerized tomography (CT) is the initial comprehensive imaging done in patients with suspected pancreatic cancer. Use of non-contrast CT to evaluate pancreas is limited to patients with renal failure or allergic reactions to iodinated contrast agent used. As the pancreatic tumors are hypo vascular and can be visualized only with contrast imaging, non-contrast CT scans have poor sensitivity and specificity for pancreatic tumors and hence cannot be relied on to make a diagnosis.

CT with Intravenous (IV) Contrast Multi detector CT (MDCT) provides very thin slice cuts, higher image resolution and faster image acquisition. Contrast enhanced MDCT can be used to evaluate local extension, invasion of adjacent vascular structures and surgical respectability with an accuracy of 80 to 90%. However for pre-operative staging, it is limited in detecting liver metastases and early lymph node metastasis. The absolute contra-indications of contrast CT

are in patients with renal failure and contrast allergy.

Magnetic resonance imaging (MRI) can be used in imaging for pancreatic cancer in patients with equivocal findings at ultrasound or MDCT. MRI examination of the pancreas is done with intravenous administration of contrast material and gadolinium is the most commonly used agent. Pancreatic cancer is hypo intense on gadolinium-enhanced T1-weighted images in the pancreatic and venous phases because it is hypo vascular with abundant fibrous stroma compared to the pancreatic parenchyma. Tumors appear iso- intense on delayed images because of slow wash-in of contrast medium. MRI is commonly used to detect pancreatic cancer when a mass lesion is not identifiable on CT scan. There is however no significant diagnostic advantage of MRI over contrast-enhanced CT (sensitivity of 86% on CT vs. 84% on MRI). Magnetic resonance cholangiopancreatography (MRCP) is a useful adjunct to other radiographic diagnostic techniques and may emerge as the preoperative imaging procedure of choice for patients with suspected pancreatic cancer. MRCP uses magnetic resonance technology to create a three dimensional image of the pancreatic biliary tree, liver parenchyma, and vascular structures. MRCP is better than CT for defining the anatomy of the biliary tree and pancreatic duct, has the capability to evaluate the bile ducts both above and below a stricture, and can also identify intrahepatic mass lesions. It is reportedly as sensitive as ERCP in detecting pancreatic cancers and unlike conventional ERCP, does not require contrast material to be administered into the ductal system.

Percutaneous Biopsy. MSCT guided percutaneous core biopsy is first choice modality of sample taking in cases with PC. Prior local anesthetic is administrated and 14G needle tru-cut biopsy is performed.

4. RESULTS

In this study we included only patient first time diagnosed with MSCT or MR with pancreatic carcinoma at our institution. There were in total 362 cases. All patients were diagnosed in University clinical center of Kosovo (UCCK). As first diagnostic modality was Abdominal Ultrasound, MSCT in 100% (n=362), MSCT and MRI in same patients 48.3 % (n=175). Prevalence of carcinoma of the pancreas for 5 years in Kosovo has proved to be prevalence is 19.9: 100,000 inhabitants.

Out of 362 patients, 67% were males (n=242) and 33 % (n=120) females. Imaging Features of Tumors Presented by Imaging Modalities.

Out of 362 recently diagnosed pancreatic cancers, in 79% (n= 286) cases is presented in head or neck of pancreas, 21 % (n= 76) cases in body and tail, (Table 1).

Localization of Carcinoma of pancreas		N (%)
Head and neck	Body and tail	
79 % (n=289)	21 % (n=76)	100.0% (n= 362)

Table 1. Localization of carcinoma of pancreas

In most cases imaging presentation of tumors was with cystic component, 41.2 % (n=149), solid component, 25.7 % (n= 93), and solid with component cystic − necrotic 33 % (n=119), (Table 2).

Carcinoma of pancreas			N (%)
Cystic component	Solid component	Solid with component cystic-necrotic	
41.2 % (N=149)	25.7 % (N=93)	33 % (N=119)	100.0% (N= 362)

Table 2. Pancreatic carcinoma by pathological component

Imaging Presentation of distant metastases, infiltration, and local manifestations of tumor liver metastases are found in 35. 1 % of patients (n=127), lung metastasis with or without hilar lymphadenopathy was found in 12. 2 % (n= 44), peritoneal carcinomatosis was found in 8. 8 % (n=32), and in adrenal metastatic was found 6 % (n=22), regional lymph node involvement in 83 % (n=300) of total n= 362 cases. (Table 3).

Imaging Presentation of distant metastases				
Liver metastases	Lung metastases	Peritoneal carcinomatosis	Adrenal metastases	Regional lymph node
35.1 % (N=127)	12. 2 % (N= 44)	8. 8 % (N=32)	6 % (N=22)	83 % (N=300)

Table 3. Imaging presentation of distant metastases

Most of local infiltration was presented as duodenal (ampullar) infiltration, 26% (n=94) patients. In 15 % (n=54) of patients was found gastric infiltration, in 57 cases 16 % spleen infiltration and in 43 % (n=155) local mesenteric infiltration. (Table 4).

Local infiltration			
Duodenal infiltration	Gastric infiltration	Spleen infiltration	Local mesenteric infiltration
26 % (n= 94),	15 % (n= 54)	16 % (n=57)	43% (n=155)

Table 4. Local infiltration

Images of PC Obtained in Our Institution (MRI and MSCT) and core guide biopsy and histopathology
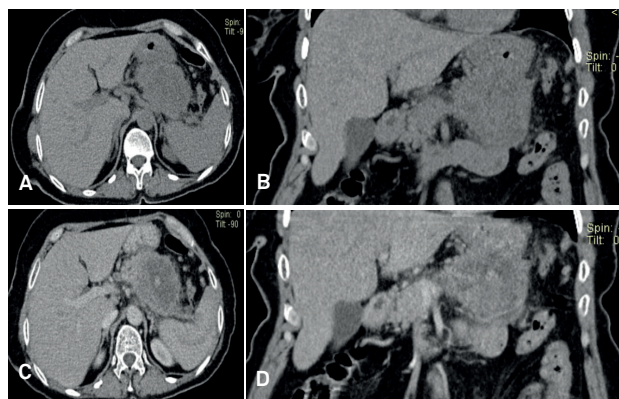

Figure. 1. NCE MSCT (a, b), CE MSCT (c, d) scan of pancreas axial and coronal plane: Expansive process of tail and body of pancreas solid mass with cystic- necrotic component.
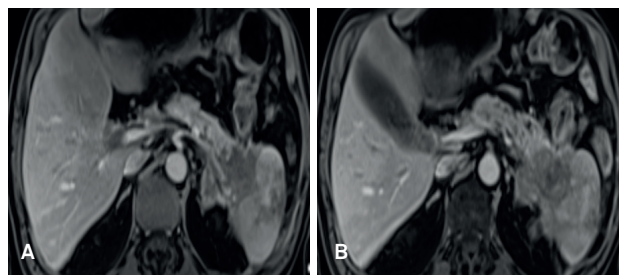

Figure. 2. CE MRI of upper abdomen axial plane (a, b): Pancreas tail neoplasm with infiltration of spleen and liver metastases.
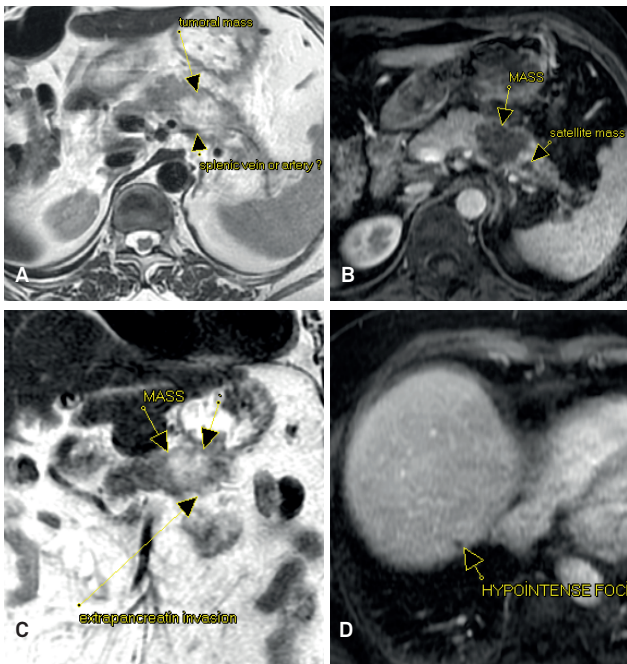
Figure. 3. CE MRI of upper abdomen axial plane (a, b, d), tumoral mass lesion body part of pancreas, one satellite lesion is noted laterally in body part, invasion beyond pancreatic capsule, especially posterior-inferiorly and anteriorly. There is impression for splenic vein encasement. Metastases in liver.
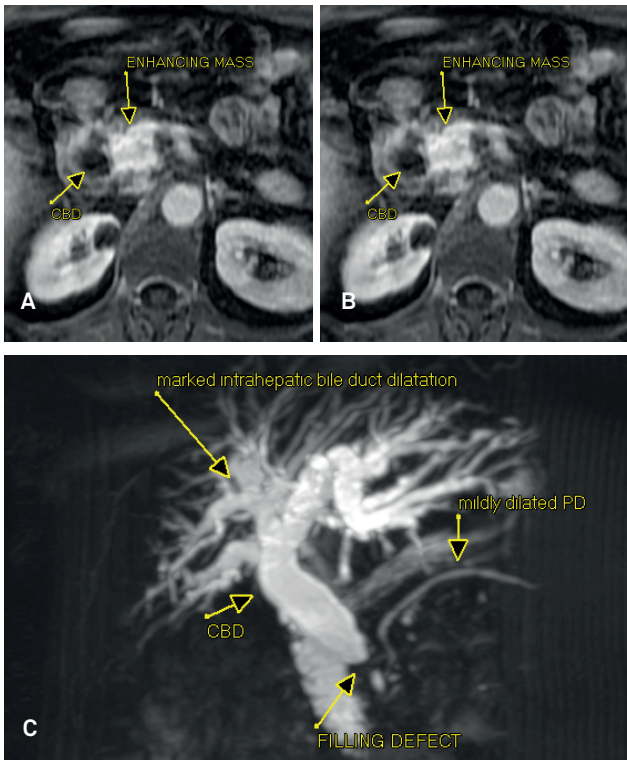

Figure 5. CE MRI of upper abdomen axial plane (a),coronal plane (b): The largest tumor lesion in the central structure includes paraaortik region and lies in order intraperitoneal and retroperitoneal. Heterogeneous lesion. Vases blood infiltration of the aorta and proximal part of the VCI. CE MRI of upper abdomen axial plane (c), liver multifocalis metastases with hepatomegali and multiple nodular lesions in the lower lobes of the lung—metastatic shared (d).

Figure. 4. CE MRI of upper abdomen axial plane (a, b, d), tumoral mass lesion head of pancreas extracapsullar. MRCP (d) dilatation of the bile ductus pronounced proximal intrahepatike and liver. DCB obstruction distal level.

Figure. 6. CE MRI of upper abdomen axial plane (a, b): There is tumoral mass lesion located in pancreatic head-body junction level, T2-hyperintense masses lesion in posterior inferior segment of right liver lobe and caudate lobe in lateral segment of liver lobe—metastasis. Pancreatic duct is totally obstructed at pancreatic head level with marked distal dilatation. CBD is coursing just lateral mass lesion and there is no remarkable invasion at this stage. There is extra pancreatic invasion involving superior mesenteric arterial root.

5. DISCUSSION

Incidence of pancreatic carcinoma in Kosovo is increasing, but according to world-wide data it is reaching the incidence of developed countries. This is explained by utilization of advanced imaging modalities in routine examination of patients with complains suspected for pancreatic disease. Ac-
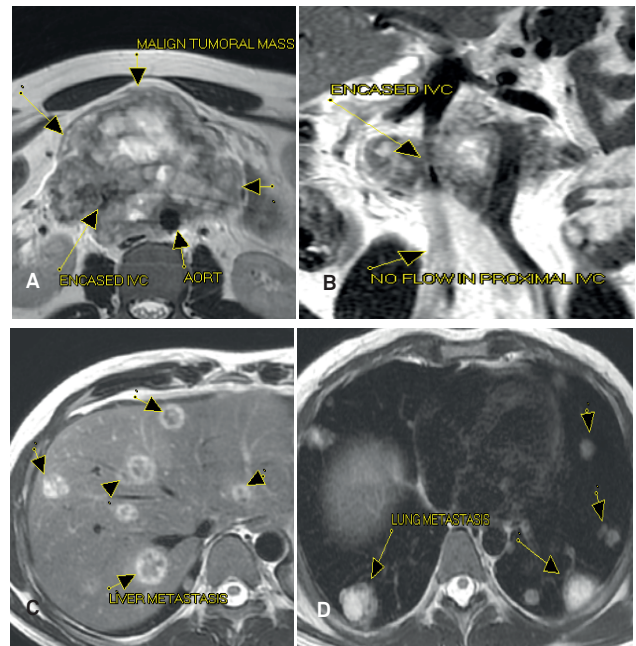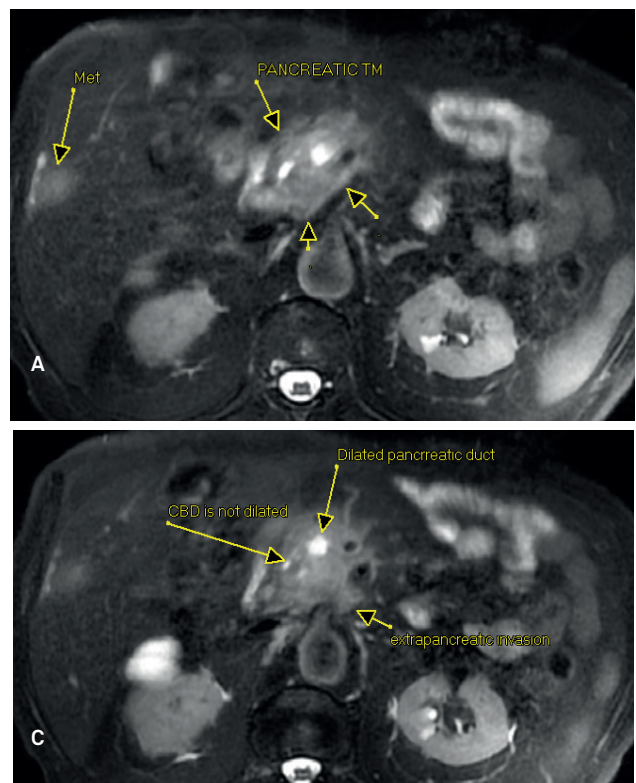
cording to our studies, the M/F ratio is 1: 1.6 (223/139) that is not different from similar studies done in European countries (M/F ratio is 1.6:1) (19). The results obtained in Balkan coun-
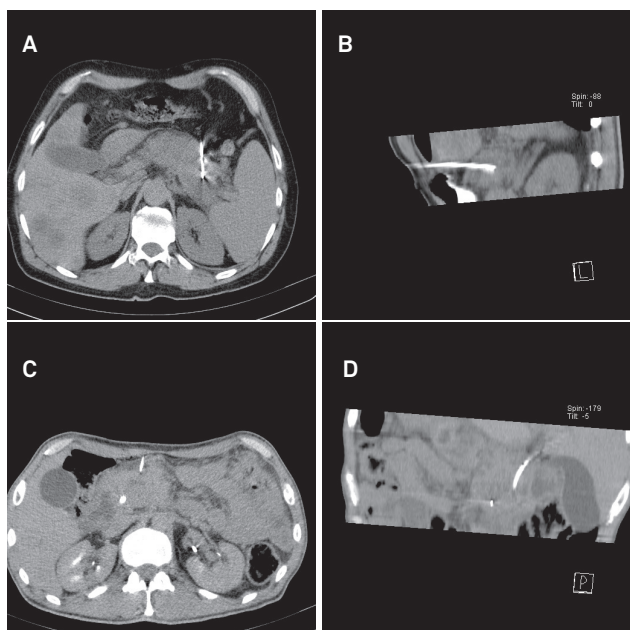
Figure. 7. Percutaneous biopsy of the pancreas MSCT: Axial plane (a) dhe Sagital plane (b): Pancreas body and tail neoplasm with local infiltration of adjacent blood vessel, gastric infiltration and liver metastases. Axial plane (c) dhe Sagital plane (d): Pancreas head and neck neoplasm with local infiltration of adjacent blood vessel, gastric infiltration and liver metastases.
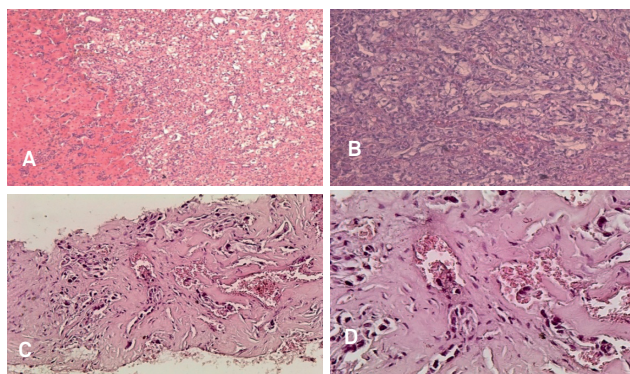

Figure. 8. Histopathological preparations (a, b, c, d) – Histopathologic findings show erythrocyte domination and many clusters of malign epithelial cells. In some microscopic fields tumor cells show lumen obliterations (verified the sample taken for ductal adenocarcinoma).

tries are approximately same as Europeans (M/F is 1.5:1), (20) while resulted statistics in UK are inversed (M/F is 1:1.3) (21). As to age/group, all statistics show that the most attached fraction is 61-70 year age group. Even the endoscopic ultrasonography was not included in our examination methods, this did not have significant impact in diagnosis of pancreatic carcinoma (22). The early diagnosis of pancreatic carcinoma correlates (as in other studies) with tumor localization – the tumors of the head was easily diagnosed (in contrary to body and tail tumor that were diagnosed in advanced stages). The percentage of cases with nearby and distant metastases (30%)–especially in liver, are similar to the results obtained in other countries (23). The imaging characteristics are similar at all types of tumors - hypo density in MSCT and hypo intensity MRI. The cases with cystic components that were not totally differentiated in MDCT were examined and diagnosed in MRI due to higher sensitivity. Digital subtraction angiography was not routinely used in our study since most of the examinations of blood vessels that were crucial

for staging, were done and diagnosed with the use of MDCT (24). Despite different difficulties in diagnosis and treatment of PC in Kosovo, the statistics of survival rates are similar with statistics in European countries. Survival time in Kosovo is 3-16 months (after 4 years there are only 52 (14.4%) patient still alive - out of 362 that were diagnosed during the period 2011-2015).

6. CONCLUSION

MDCT is the preferred initial imaging modality in patients with clinical suspicion for pancreatic cancer with 90% specificity and 90% sensitivity. Special emphasis is given to the impact of multi detector CT and post processing imaging techniques on the staging (almost 100 %) of pancreatic adenocarcinoma. The MRI was used for further differentiation of mixed tumors (high sensitivity for cystic component) interchangeably with MRCP that helped in differentiating of PC from chronic pancreatitis. It is understandable that the most accurate diagnosis were obtained after percutaneous core biopsy. The combination of different diagnostic imaging methods along with multiple laboratory analysis and multidisciplinary clinical cooperation was the preferred method for accurate and early diagnosis of PC. We recommend this type of clinical work in order to have best possible results.

• Conflict of interest. None declared.

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