pISSN: 2088-8686
eISSN: 2686-0864

SCRIPTA SCORE
Scientific Medical Journal
Research

Scanographic Profile of Pancreatic Tumor and Other Lesion in 3 Radiology Departments in Kinshasa

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ABSTRACT

Background: Pancreatic pathologies are polymorphic in nature, form and clinical expression, grouping together all the local and general manifestations linked to an anomaly in the functioning of the pancreatic structures. **Objective**: Our objective was to describe the scanographic profile of pancreatic tumors in 3 radiology departments in Kinshasa. **Methods**: Comparative study conducted in 3 radiology departments in Kinshasa from January 2016 to June 2021, having retained 86 reports of abdominal CT-scans of patients with pancreatic pathology including 62 cases of pancreatic tumors. **Results**: Male patients were in the majority (sex-ratio M/F=1.6) with a mean age of 55.7±14.7 years (16 to 92 years). The frequency of pancreatic tumors was higher (62 cases/86) compared to that of inflammatory pathologies (20 cases/86). Cholestasis syndrome (50%) and abdominal (epigastric) pain were the most common indications. In tumors the contours were lobulated (56.1%) compared to pancreatitis, where they were blurred in 80% ($p<0.05$). In 45% of pancreatitis the peripancreatic fat was infiltrated, against 16.7% in tumors ($p=0.01$). The Wirsung duct was dilated in most tumors compared to pancreatitis where it was irregular with calcifications ($p<0.05$). The tumors were resectable in 26% of cases. **Conclusion**: The abdominal CT-scan contributes to the diagnosis of pancreatic pathologies. Tumors are the most common, most of them unresectable . It is often an elderly male subject with a clinical indication.

Keywords: Abdominal CT-scan, pancreatic tumors.

ABSTRAK

***Latar Belakang**: Patologi pankreas bersifat polimorfik dalam bentuk dan ekspresi klinis, pengelompokkan semua manifestasi lokal dan umum yang terkait dengan anomali fungsi struktur pankreas. **Tujuan**: Tujuan kami adalah untuk menggambarkan profil scanografi tumor pankreas di 3 departemen radiologi di Kinshasa. **Metode**: Studi dilakukan di 3 departemen radiologi di Kinshasa dari Januari 2016 hingga Juni 202 dengan 86 laporan CT-scan abdomen pasien dengan patologi pankreas, 62 di antaranya kasus tumor pankreas. **Hasil**: Pasien laki-laki (rasio jenis kelamin M/F=1,6) merupakan yang terbanyak dengan usia rata-rata 55,7±14,7 tahun (16 hingga 92 tahun). Frekuensi tumor pankreas lebih tinggi (62 kasus/86) dibandingkan dengan inflamasi patologi (20 kasus/86). Sindrom kolestasis (50%) dan nyeri perut (epigastrik) adalah indikasi yang paling umum. Pada tumor, konturnya berlobus (56,1%). Sedangkan pada pankreatitis, memiliki gambaran yang kabur pada 80% ($p<0,05$). Pada 45% pankreatitis, lemak peripankreas disusupi, sedangkan pada tumor sebanyak 16,7% ($p=0,01$). Duktus Wirsungi mengalami dilatasi pada sebagian besar tumor, sedangkan pankreatitis memiliki bentuk tidak teratur dengan kalsifikasi ($p<0,05$). Tumor dapat dioperasi pada 26% kasus. **Simpulan**: CT-scan abdomen berkontribusi pada diagnosis patologi pankreas. Tumor adalah kasus yang paling umum dan sebagian besar tidak dapat dioperasi. Pria lanjut usia sering memiliki indikasi klinis.*

Keywords: CT-scan Abdomen, Tumor pankreas.

INTRODUCTION

Pancreatic pathologies are polymorphic in nature, form and clinical expression, grouping together all the local and general manifestations linked to an anomaly in the functioning of the pancreatic structures. Apart from diabetes mellitus, acute pancreatitis, chronic pancreatitis and tumoral lesions seem to be the best described pancreatic pathologies today.[1-7]

Computed tomography has proven to be very rewarding for the study of silent anatomical areas in conventional radiology and ultrasound. The CT-scan is more sensitive and more specific than the ultrasound but it will only be done as a second intention because it is a heavier and more expensive examination.[5] Our general objective is to describe the scanographic profile of several pancreatic pathologies in three radiology departments in Kinshasa.

METHODS

Type of Study

This is a comparative study that included data from 3 hospital structures with at least one medical imaging department including operational CT during our study period from June 2016 to June 2021, i.e. during a period of 5 years.

This study includes all reports of abdominal CT-scans having diagnosed pancreatic pathology in the 3 medical imaging departments selected for our study during the above-mentioned period.

Inclusion and Non-Inclusion Criteria

a. Inclusion criteria

Were retained in our study, the reports of the abdominal scanners which contained the following elements:

- Socio-demographic characteristics: age and gender ,
- The indication of the abdominal CT-scan,
- scanographic diagnosis retained after examination.

b. Non-inclusion criteria

Not included in this study:

- All descriptive reports, ie without radiological conclusion.

Sample Size

Our sample size was n=86. This is a non-probability and convenience sample drawn from an exhaustive population.

Variables of Interest and Operational Definitions

- Age : all ages were considered; the patients were grouped by age group, expressed in number of years.
- Sex : Both genders were taken into account, i.e. female and male.
- The Indication of the abdominal CT-scan : clinical, suspicious ultrasound, check-up
- Descriptive elements of the pancreas on CT scan
  - Contours of the pancreas : external limits of the pancreas on CT scan which may be blurred, lobulated, regular.
  - Size: the estimated CT dimension of the pancreas can be increased, decreased, normal
  - Density: the density of the pancreas which can be hypodense , isodense , liquid, mixed, tissue
  - Enhancement: modification of the density of an organ after injection of contrast product, possibly homogeneous, heterogeneous
  - Necrosis: localized or generalized enhancement defect of the gland
  - Necrosis flows: altered liquid density generally between 20 and 40 HU

- CT scan diagnosis : Conclusion of the report

Collection Technique

We used computerized registers in all the structures visited for our study. All abdominal CT-scan reports were recorded on computer in Excel databases. We sorted, among these abdominal CT-scan reports, those having concerned pancreatic pathologies according to our inclusion and non-inclusion criteria as listed above.

Exploration Protocol

All examinations were performed on a Siemens brand scanner. The reading of these scanographic images was made by doctors specializing in medical imaging with more than 10 years of experience.

Le Rocher Imaging Center

At the Le Rocher imaging center, all examinations were carried out on a 16-barette scanner (Satomom FORCE, Siemens Healthcare, Forchheim, Germany, manufactured in 2005) put into service for 5 years. Abdominal CT acquisition parameters are summarized in **Table I.**

Table I Protocol and parameters for contrast medium application

Parameters	Values
Detectors	16
Kv	120
mas	150
Rotate time	0.5s
pitch	1.2
Slice collimation	3mm
Slice width/increment	2/1.4mm
Iterative reconstruction Siemens Healthcare , Forchheim , Germany	Model-Based Algorithm (ADMIRE)
rebuilding strength	Level 3
Rebuild Core	Bf40
Post treatment	MPR, VRT and MIP
Automatic injector	Envision CT injector EHU 700,

Description of The Procedure and Technical Parameters

General protocol for abdominal CT-scan:

i) Patient preparation and position

- Patient on a water diet (two glasses of water just before the acquisition)
- Inspiratory apnea
- Supine position

ii) Description of the procedure

- Helical acquisition
- Examination volume: from the diaphragmatic domes to the symphysis
- Acquisition without injection of contrast product
- Injection of iodinated contrast medium
- Acquisition after injection of contrast product

Five main acquisition times during abdominal exploration in CT:

1. The phase without injection which makes it possible to highlight the presence of calcifications, of a fatty, gaseous, liquid or hematic component within a lesion or a collection, or even the presence of exogenous material (ex: surgical clips).
2. The so-called early arterial phase , acquired 20 to 30 seconds after injection or ideally as soon as the peak of aortic enhancement is automatically detected: allows optimal visualization of the arterial network, before parenchymal enhancement, it is particularly important for mapping the arterial vascularization, orthotopic liver transplantation or arterial endovascular treatment.

3. The so-called late arterial phase is acquired 35-40 seconds after the start of the injection (or at 15-20 seconds automatic detection of the aortic enhancement peak) and makes it possible to highlight lesions which have an essentially arterial vascular supply such as benign hepatocyte lesions , focal nodular hyperplasia, and hepatocellular or malignant adenoma (hepatocellular carcinoma, or hyper-enhanced liver metastases in the so-called “hypervascular” arterial phase.
4. The portal phase is then performed 70 to 90 seconds after the start of the injection (or 15-20 seconds after automatic detection of the aortic enhancement peak). The portal phase makes it possible to analyze in an optimal manner the enhancement of the parenchyma, in particular the liver, which will be maximal, the hepatic vascular supply being mainly portal venous.
5. The late or "equilibrium" phase : is carried out 3 to 5 minutes after the start of the injection. It is fundamental for the analysis of a lesion suspected of HCC, in search of lesional washout. This phase also allows a better dynamic analysis of the vascular filling in the case of hepatic angiomas, in particular in the case of cavernous or sclerotic hemangiomas.

Standard Protocol for CT Exploration of The Pancreas

1. 2 glasses of water just before the acquisition to distend the duodenum to avoid gas artifacts
2. Phase acquisition
   - Without intravenous injection of contrast product looking for calcifications
   - Pancreatic time 45-50' after start of injection for maximum enhancement of the gland
   - Portal time 80' after the start of the injection
3. Injection: 1.5 to 2 cc/Kg
4. Reconstruction: MPR, MIP, minIP

Data analysis technique

Data were entered in Excel 2010 software. They were then exported to SPSS 21 (Statistical Package for social sciences), version 21.0 for processing and analysis.

Mean and standard deviation were calculated for symmetrically distributed quantitative data. Relative (%) and absolute (n) proportions were calculated for categorical data. Pearson's chi-square test was performed for comparison of proportions. While the T - student test was used to compare the means. For all the statistical tests carried out, the threshold of statistical significance (p-value) was $p < 0.05$.

Ethical Considerations

Data processing took place anonymously and strictly confidentially. The data has been treated fairly.

RESULTS

Relative Frequency of Pancreatic Tumors on Computed Tomography

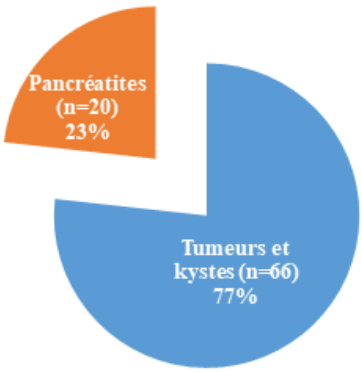

Figure 1. Distribution of patients according to the nature of pathology observed

Figure 1 above shows that tumoral and cystic pathologies were largely predominant with 66 cases (77%).

General Description

For the vast majority of pancreatitis, the pancreas presented blurred contours (80%) compared to tumor pathologies (28.8%). The difference was statistically significant (p=0.00). On the other hand, the contours of the pancreas with tumor pathologies were lobulated in most cases (56.1%) with a significant difference compared to the contours of the pancreas in both acute and chronic pancreatitis (p=0.03). Pancreas with tumors and cysts showed more increased size compared to patients with pancreatitis (p=0.00). By comparing the density of the pancreas in tumoral and inflammatory pathologies, we did not observe a statistically significant difference (p>0.05). Necrotic lesions as well as calcifications were mainly observed in pancreatitis with a statistically significant difference compared to tumoral and cystic pathologies.

Table II. General description of pancreatic pathologies on CT-Scan

VARIABLES	Total n=86 (%)	Tumors and Cysts n=66 (%)	Pancreatitis n=20 (%)	p
Outlines				
Blurs	35(40.7)	19(28.8)	16(80)	0.00
Lobules (irregular)	41(47.7)	37(56.1)	4(20)	0.03
Regulars	10(11.6)	10(15.2)	0	0.00
Cut				
Augmented	77(89.5)	61(92.4)	16(80)	0.00
Diminished	4(4.7)	0	4(20)	0.06
Normal	5(5.8)	5(7.6)	0	0.08
Density				
Hypodense	50(58.1)	35(53)	15(75)	0.23
Isodense	2(2.3)	2(3)	0	0.08
Fluid	4(4.7)	3(4.5)	1(5)	0.22
Mixed	2(2.3)	1(1.5)	1(5)	0.27
Tissue	28(32.6)	25(37.9)	3(15)	0.13
Enhancement				
NO	34(39.5)	20(30.3)	14(70)	
YES	52(60.5)	46(69.7)	6(30)	0.00
Parenchyma				
Heterogeneous	62(72.1)	54(81.8)	8(40)	0.00
Cystic	1(1,2)	1(1.5)	0	0.13
Homogeneous*	16(18.6)	9(13.6)	7(35)	0.11
Loss of lobulation	7(8.1)	2(3)	5(25)	0.03
Calcification	8(9.3)	3(4.5)	5(25)	0.02
Necrosis	12(14)	5(7.6)	7(35)	0.01
Canal calcification	1(1,2)	0	1(5)	-

*Only normal characteristic of the parenchyma (18.6%)

Peripancreatic Lesions

The peripancreatic fat was affected in 45% in pancreatitis, whereas it was only in 16.7% in tumoral and cystic pathologies with a statistically significant difference (p=0.01). Perilesional edema was mainly diffuse in pancreatitis with a statistically significant difference compared to tumoral and cystic lesions (p=0.03).

Table 3. Distribution of patients according to peripancreatic lesions

Variables	Total n=86 (%)	Tumors and Cysts n=66 (%)	Pancreatitis n=20 (%)	P
Infiltration of peripancreatic fat	20(23.3)	11(16.7)	9(45)	0.01
Edema Diffuse	3(3.5)	1(1.5)	2(10)	0.03
Edema Localized	1(1,2)	0	1(5)	0.12

Injury to The Wirsung Duct and The Bile Tract

The Wirsung duct was dilated in 43 patients (50%), most of them with tumor pathology (p=0.00). While the irregularity of this channel and the presence of calcifications were mainly observed in pancreatitis. The involvement of the bile ducts and the presence of gallstones were widely noted in the tumoral and cystic pathologies (p<0.05).

Table 4. Damage to the bile ducts and the main pancreatic duct

VARIABLES	Total n=86 (%)	Tumors and Cysts n=66 (%)	Pancreatitis n=20 (%)	p
Wirsung canal dilation	43(50)	39(59.1)	4(20)	0.00
Wirsung canal irregularity	1(1,2)	0	1(5)	0.23
Wirsung canal calcifications	1(1,2)	0	1(5)	0.23
Wirsung canal compression	11(12.8)	11(16.7)	0	0.04
Bile duct damage	44(51.2)	42(63.6)	2(10)	0.00
Billary gallstone	17(19.8)	17(25.8)	0	0.01

Study of Tumoral and Cystic Pathologies

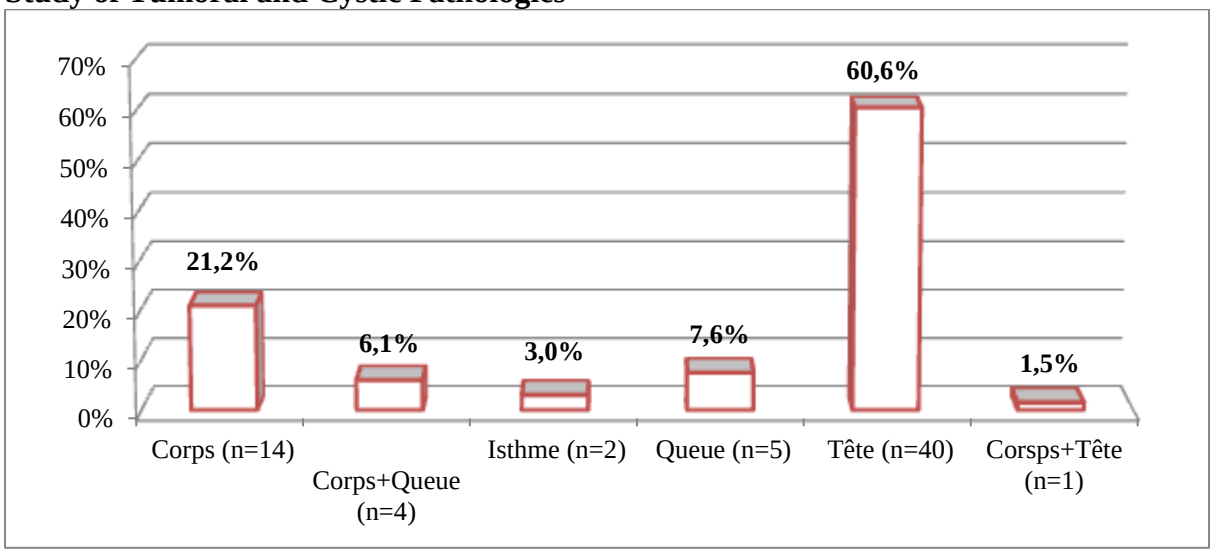

Figure 2. Distribution by location of tumor lesions

The majority of tumor lesions were observed in the pancreatic head with 40 cases (60.6%) followed by the body of the pancreas with 14 cases (21.2%).

Characteristics of Tumor Lesions According to The Affected Areas

Metastases, locoregional invasion and biliary tract involvement were found in 36 cases (54.5%) respectively; 45 cases (68.2%) and 42 cases (63.6%). All these lesions were mostly noted in tumors of the pancreatic head ($p<0.05$) and pancreatic tail (metastasis and locoregional invasion).

Table III General characteristics of tumor lesions

Zoned	not(%)	Meta. *	p	Invaded. ** .	P	GB impairment	p
Head	40(60.6)	21(52.5)	0.02	28(70)	0.00	33(82.5)	0.00
Body	14(21.2)	5(35.7)	0.16	8(57.1)	0.31	7(50)	0.12
Tail	5(7.6)	5(100)	0.00	3(60)	0.01	1(20)	0.31
Isthmus	2(3)	1(50)	0.23	2(100)	0.42	1(50)	0.23
body and tail	1(1.5)	4(100)	0.33	4(100)	0.06	0	0.91
body and head	2(3)	0	-	0	-	0	-
All	66(100)	36(54.5)	-	45(68.2)	-	42(63.6)	-

The Sites of Metastases

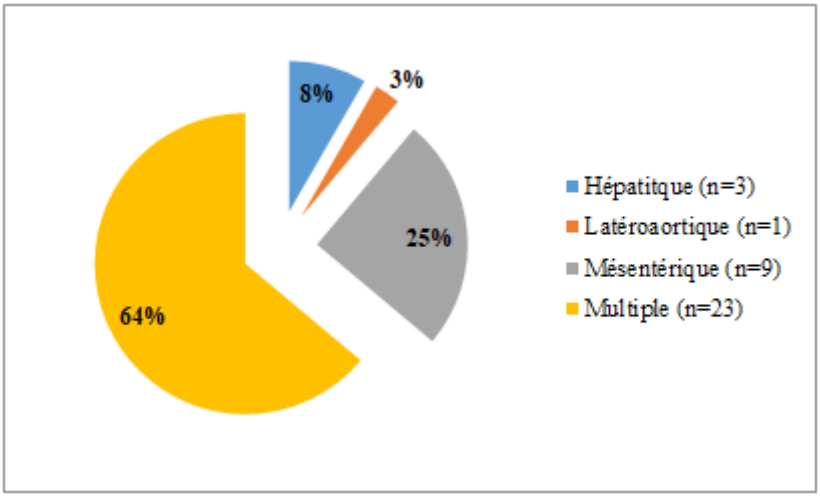

Figure 3. Distribution of observed metastases by site

In most cases, metastases were objectified to multiple regions of the abdominal cavity in 23 patients (64%). Mesenteric metastases were observed in 9 patients (25%).

State of The Retro-door Blade

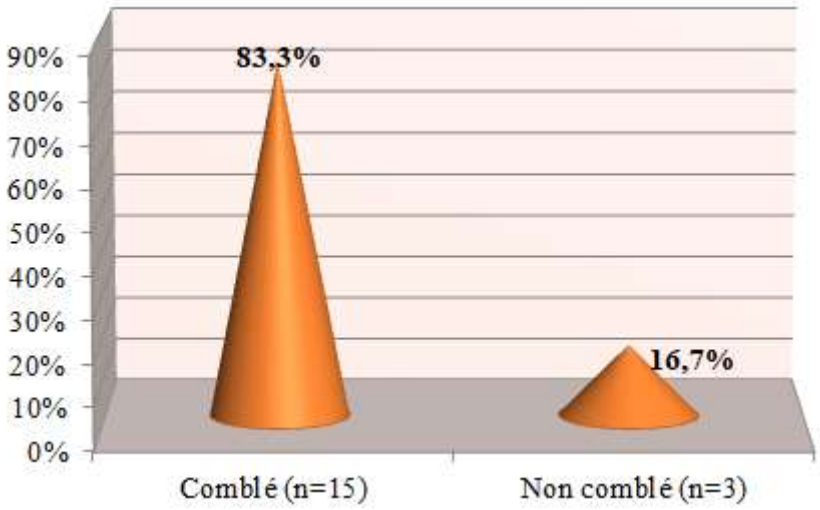

Figure 4. State of the retro-door blade

Information on the retroportal lamina was only given in 18 out of 62 patients with pancreatic tumour . This lamina was filled in 83.3% of reported cases.

Resectability of The Mass

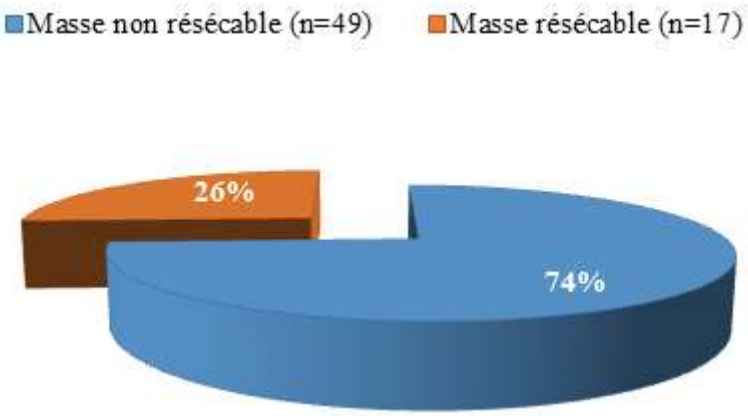

Figure 5. Distribution of lesions according to resectability

Of all cases of tumor lesions reported, Figure 17 shows that only 17 cases (26%) were surgically resectable versus 49 cases (74%) unresectable .

DISCUSSION

Epidemiological Data

The relative frequency of pancreatic tumors on CT is by far the highest pathologies in 72.2%, followed by acute pancreatitis in 17.4%, and chronic pancreatitis in 5.8%. While cysts were found in 4.6%.

This agrees with the result of Biwole MS et al. [8] who report a predominance of pancreatic tumors observed on CT with 55.9% of cases. This predominance of pancreatic tumors could be explained by the fact that most tumoral lesions of the pancreas develop quietly and are diagnosed late, when the obvious clinical, biological and radiological signs of the disease appear. Also, just with lipasemia >3 times the normal and a typical clinic, the diagnosis of pancreatitis can be established, whereas this is not always obvious in tumoral lesions for which the use of imaging remains the best and most plausible means of diagnosis.[1,5]

Furthermore, Saad et al [9] revealed that between 1973 and 2014, the standardized incidence rates of pancreatic cancer increased by 1.03% per year. This translates to the fact that pancreatic cancer is expected to rise from the 4th to the 2nd leading cause of cancer death in the United States by 2030.[10,11]

Incidence rates vary widely from country to country. The highest incidence is observed in Europe and North America, and the lowest in Africa where accessibility to modern diagnostic means is low, given the socio-economic conditions of the population.[12]

Wong et al [13] demonstrated that there are higher incidences of pancreatic cancer in countries with a higher human development index. However, the large disparities in the incidence of pancreatic tumors between countries also suggest that environmental factors play an important role as risk factors for the disease.[14]

In fact, pancreatic tumors are ranked 14th among the most common tumors and 7th among the causes of cancer mortality in the world.[15] Estimates from Globocan [15] revealed that there would be 458,918 pancreatic cancer diagnoses and 432,242 pancreatic cancer deaths worldwide in 2018.

While CT is said to have a sensitivity of 89-97% for pancreatic tumors (including adenocarcinoma), although it is

less effective in diagnosing small lesions (< 2 cm) with a sensitivity of 65-75% or still from 70% to 100% according to the authors.[16, 17] Currently, it has always been indicated in case of suspicion of a malignant tumor of the pancreas in the clinic or on ultrasound. Computed tomography (CT) is now one of the main methods for staging a suspected pancreatic tumor.[18]

In addition to the ability to detect and stage pancreatic tumors, CT allows more selective surgery for patients with "resectable disease"[18] In our study, we report a rate of 26% of resectable tumors.

However, 27% of pancreatic adenocarcinomas less than 2 cm are isodense on CT and therefore not directly identifiable. Thus, it is described in the literature that the detection of pancreatic adenocarcinomas would be superior in magnetic resonance imaging (MRI) compared to computed tomography.[19 - 22]

On the other hand, as with other cancers, only less than 10% of pancreatic cancer cases occur in individuals under 55 years of age, and the median age of onset is 71 years.[4,5] The mean age for pancreatic tumors was 57.4 ± 14.9 years in our series. This discrepancy is justified by the fact that we also included benign tumors in our study.

Clinical Context and Indication

In our study, 95.3% of CT indications were clinically oriented, including cholestasis syndrome in 50% and abdominal pain. Only 4.7% of patients came for suspected pancreatic pathology on ultrasound. These results corroborate those of Biwole MS et al [8] who found 81.4% clinical indication and 16.7% ultrasound orientation. This large predominance of clinical indication is justified by the fact that apart from pathologies of the endocrine pancreas (diabetes mellitus in particular) whose diagnosis seems to be common in the medical community, the diagnosis of pancreatic tumors and pancreatitis is complex, and requires in most cases radiological exploration and enzymatic assay.

CT Scan Profile of Pancreatic Pathologies

The vast majority of inflamed pancreases had blurred contours (80%) compared to tumor pathologies (28.8%) with a statistically significant difference (p=0.00). On the other hand, the contours of the pancreas with tumor pathologies were lobulated in most cases (56.1%) with a significant difference compared to pancreatitis (p=0.03).

We also noticed that, in our series, the duct of Wirsung was dilated in 43 patients (50%), most of whom had a tumor pathology (p=0.00). While the irregularity of this channel and the presence of calcifications were observed mainly in patients with pancreatitis. The involvement of the bile ducts and the presence of gallstones were widely noted in the tumoral and cystic pathologies (p<0.05). These results agree with what is reported in the literature.[1, 2,7]

Our results can be superimposed on those of Atif Zaheer et al [23] who had found in patients with histologically confirmed pancreatic cancer, a focal mass (78%), pancreatic duct dilation upstream of > 5 mm from the mass (69%) and parenchymal atrophy (53%).

Indeed, pancreatic adenocarcinoma typically results (in 85 to 95% of cases) in a hypodense mass , often lobulated, after injection of iodinated contrast product. In 5 to 15% of cases the lesion is iso dense to the pancreas and therefore not directly visible.[1] The indirect signs depend on the site of the lesion: these signs result from the consequences of the tumoral obstacle: dilation of the intra- and extra-hepatic bile

ducts, dilation of the main pancreatic duct, pancreatic parenchymal atrophy upstream of the tumor.[1, 2, 7]

❖ **Parenchyma and Necrosis**

Parenchymal damage was noted in 81.4% of cases. Necrotic lesions as well as calcifications were mainly observed in pancreatitis with a statistically significant difference compared to tumoral and cystic pathologies. Without specifying which ones, Biwole MS et al [8] reported a 99% frequency of parenchymental lesions .

❖ **Peripancreatic Lesions**

The peripancreatic fat was affected in 45% in pancreatitis, whereas it was only in 16.7% in tumoral and cystic pathologies with a statistically significant difference (p=0.01).

Our results are similar to those of Atif Zaheer et al [2,3] who found soft tissue infiltration around the superior mesenteric artery and vein in a higher frequency in patients with pancreatic tumor compared to patients with pancreatitis.

Indeed, it is described in the literature [1,2,7] that in CT, the formal signs of vascular invasion by pancreatic adenocarcinoma are as follows:

- occlusion or thrombosis,
- A reduction in the caliber of the vessel (stenosis),
- Tissue engulfment over 180° or more of the vessel, even in the absence of a decrease in caliber. These signs are classically accompanied by an contiguity between the pancreatic tumor and the vascular abnormalities.

State of The Retro-Portal Blade and Tumor Resectability Criteria

In our series, the retro-gate blade was filled in 83.3%. Only 17 cases (26%) were resectable against 49 cases (74%) unresectable. The precise study of the retro-portal plate (region in contact with the superior mesenteric vessels) is an important issue in the interpretation of CT examination.[1]

The high proportion of unresectable tumors in our series (74%) is explained on the one hand by the late diagnosis of the disease in a very advanced stage and on the other hand by the close relationship of the tumor with the vascular structures, the thrombosis extensive deep vein disease and the existence of hepatic metastases.

Our result corroborates that of Ould - Cheikh et al [2,4] in 2018 in Morocco who had found 63.3% of unresectable tumors , a high frequency which he had also explained, by the late diagnosis in advanced stage with a counter- indication for surgery.

CONCLUSION

Pancreatic tumors often affect male subjects over the age of 40. These tumor pathologies, which for the most part are unresectable , are more frequent than inflammatory and cystic pathologies. Most often it is a clinical indication for the CT-scan which thus contributes to the diagnosis of pathologies of the pancreas.

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