LIVER ABSCESSES — SEVEN-YEAR EXPERIENCE OF A SINGLE TERTIARY CARE HOSPITAL

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We reviewed medical records of cases of liver abscesses (LA) registered in Rīga East University Hospital clinical centre "Gaiļezers" from January 2012 to October 2018 to assess sociodemographic factors, clinical, laboratory, microbiological and radiological findings, as well as therapeutic modalities and their efficacy associated with LA. A total of 95, including five recurrent, cases were included in this study. No statistically significant differences in gender distribution were found. Mean patient's age was 64.5 ± 15.9. The most common documented risk factors for the development of LA were underlying biliary tract abnormalities (37.9% of cases), and diabetes mellitus (12.7%), while in 21.1% of cases, LA were defined as cryptogenic. Most patients presented with fever (70.5%); right upper abdominal pain was reported in 61.1%, while vomiting and / or nausea — in 25.3% of cases. The most common isolates identified from LA were Klebsiella pneumonia *(40.3% of cases), mainly in monomicrobial LA, and* Escherichia coli *(22.6% of cases), predominantly in polymicrobial LA. Ceftriaxone and metronidazole intravenous formulations were used in 35.5% cases as the principal antimicrobial combination at hospital. Median overall expected duration of antimicrobial treatment was 15 days. LA drainage was performed in 87.4% of cases for the median duration of seven days. In 86.3% of cases both approaches were combined.*

Key words: *liver abscess, clinical patterns, treatment.*

INTRODUCTION

Liver abscesses (LA) are a relatively rare but significant public health problem, often causing early diagnostic difficulties and requiring a multidisciplinary approach. Studies have found that the incidence of LA in Europe ranges from 1.1 to 2.3 cases per 100 000 population per year, depending on the study population (Hansen and Schønheyder, 1998; Jepsen *et al.*, 2005).

Despite the extensive international database of LA, there is still a significant lack of data from the Baltic States. No data on the epidemiological and clinical features of LA in Lithuania or Estonia have been found in the Medline database of references and abstracts on life sciences and biomedical topics. In Latvia there has been only one published international article of 41 patients at Pauls Stradiņš Clinical University Hospital, which severely limits the statistical reliability of the data obtained (Lukjanova *et al.*, 2018).

Although according to European statistics the incidence of LA is considered to be low, mortality rates of 10–40% (Wong *et al.*, 2002), mostly due to non-specific symptoms and laboratory findings (Lardière-Deguelte *et al.*, 2015) that hinder timely diagnosis and targeted therapy (Lardière-Deguelte *et al.*, 2015) that hinder timely diagnosis and targeted therapy, should be taken into consideration. The median time to diagnosis of LA is one week after the first symptoms appear (Pung *et al.*, 2011).

Timely diagnosis and appropriate antimicrobial and/or invasive therapy tactics are most likely to ensure complete patient recovery, whereas without appropriate interventions LA are uniformly fatal (Heneghan *et al.*, 2011).

Given the lack of sufficient statistically plausible international studies on LA in the Baltic States, as well as the unequivocal lethality of the disease in cases of delayed diagnosis and/or inadequate therapeutic tactics, this study, carried out in the largest hospital in Latvia, aims to provide important information about this particular group of patients, possible risk factors, diagnostic and treatment features, which in turn would allow to draw conclusions and help healthcare professionals identify and adequately manage patients with this nosological entity.

MATERIALS AND METHODS

Medical records containing ICD-10 diagnosis codes "A06.4" (amoebic liver abscess) and "K75.0" (liver abscess) registered in Rīga East University Hospital clinical centre "Gaiļezers" from 1 January 2012 to 31 October 2018 were retrospectively reviewed.

Firstly, patient baseline data — gender, age, and medical history (co-morbidities, history of travel during the last six months, duration of complaints prior to hospitalisation, and complaints at admission) — were registered. Then, general objective findings at the admission, the length of hospital stay and the outcome were evaluated.

Secondly, the patient's laboratory results at baseline and at follow-up were registered: white blood cell (WBC) count, C-reactive protein (CRP), alanine aminotransferase (ALT), aspartate aminotransferase (AST), total bilirubin, conjugated bilirubin, procalcitonin (PCT), alkaline phosphatase (ALP), and gamma-glutamyl transferase (GGT). Subsequently, baseline radiological (ultrasound scan (US), computed tomography (CT), magnetic resonance imaging (MRI)) data, which evaluated the affected lobe of the liver, the number of abscesses, the largest abscess size (cm) and the radiologist's conclusion on the particular finding, were noted.

Thirdly, microbiological data were filled in: the isolated aetiological agents of blood cultures and drained LA, as well as their antimicrobial resistance patterns.

After evaluating anamnestic and objective data, conclusions on possible risk factors and causes of LA were made.

The final section of the protocol dealt with antimicrobial selection, respective dosage considerations, duration of treatment, whether the drainage of LA took place and what was the type and duration of it (single needle aspiration or insertion of a temporary drain). Finally, the time of defervescence after initiation of antimicrobial therapy was recorded.

The results were analysed using descriptive statistical methods: One-Sample Binomial distribution test, and the Student's T-test (t-test) for comparison of the average age of the sexes, the Wilcoxon Signed-Rank test for the statistical analysis of the laboratory parameters and the Chi-Square (χ^2) test. The significance threshold was set at 0.05 ($p < 0.05$). Results are reported using percentage and direct numeric values. Parametric data are reported using mean values with standard deviation (SD), non-parametric data — median values with interquartile range (IQR 25% — 75%). Statistical data was processed by IBM SPSS Statistics v23.

This study was approved by The Research Ethics Committee of Rīga Stradiņš University.

RESULTS

A total of 95 randomly selected cases of LA, including five relapses, were enrolled in the study. The data of five patient stationary cards with study diagnosis codes were excluded from the given study due to proven alternative diagnoses in histological findings.

General patient and disease data. Of the registered cases of LA, 52.6% (n = 50) were detected in men, mean age 61.2 ± 15.3 years (range 29–95 years), and 47.4% (n = 45) in females, mean age 68.2 ± 15.9 years (range 27–94 years). A statistically significant difference between the median ages of the two genders (t (93) = –2.2, $p = 0.03$), was found. The mean age without gender stratification was 64.9 ± 15.9 years.

According to the data of the patient stationary cards included in the study, none of the patients has been outside the territory of Latvia during the last six months.

The median duration of complaints prior to hospitalisation was six days (IQR 3–11.5, n = 93).

At the time of admission, 93 patients showed signs of LA (Table 1), while two patients had neither complaints nor positive primary objective findings.

The most common potential signs of LA were axillary temperature > 37.5 °C (77.9%, n = 74), discomfort and / or abdominal pain (69.5%, n = 66), more specific to LA in the right upper quadrant and / or epigastrium (61.1%, n = 58), and malaise (fatigue) (33.7%, n = 32).

The most common potential contributing factors to the development of LA (Fig. 1) were biliary tract disorders (38.9%, n = 37), including a history of cholecystectomy

Table 1. Patient complaints and objective findings upon admission

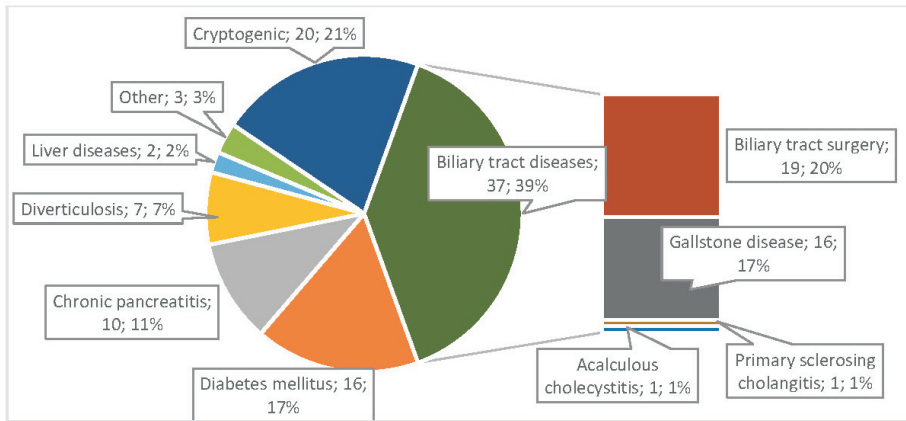| Possible signs of liver abscess	Frequency	
	n	%
Fever > 37.5 °C	74	77.9
Discomfort and/or abdominal pain	66	69.5
Malaise (fatigue)	32	33.7
Chills	16	16.8
Hepatomegaly	15	15.8
Jaundice	12	12.6
Nausea	12	12.6
Anorexia	11	11.6
Emesis	10	10.5
Weight loss	2	2.1
Hypotension	1	1.1

Fig. 1. Potential risk factors associated with the development of hepatic abscesses.

(20.0%, n = 19), diabetes mellitus (16.8%, n = 16) and chronic pancreatitis (10.5%, n = 10).

The median duration of patient's hospitalisation was 13.5 days (IQR 10–18, n = 94). Data from one patient stationary card was not included in this calculation, considering the subsequent transfer of the patient to another hospital in Latvia.

The case fatality rate due to LA in the study population was 5.3% (n = 5).

Laboratory, radiological and microbiological data. Elevated PCT (100%, n = 72), CRP (98.9%, n = 94), WBC count (86.3%, n = 82), GGT (85.7%, n = 24), ALP (67.5%, n = 27) and predominantly conjugated bilirubin levels (63.5%, n = 54) were the most common laboratory abnormalities observed in the baseline laboratory data on cases. Elevated AST and ALT levels at the baseline were found in 51.3% (n = 40) and 43.5% (n = 40) of cases, respectively.

A statistically significant decrease between the baseline and follow-up laboratory studies of the WBC count, CRP, ALT, AST, total and conjugated bilirubin, as well as PCT ($p < 0.001$) was found, while the median value of erythrocyte sedimentation rate (ESR) increased ($p = 0.028$). The dynamic comparison of the values of the laboratory parameters is summarised in Table 2.

The most used radiological techniques to detect LA were US scan and CT, with positive findings of 91.1% (n = 82) and 100% (n = 70), respectively. A positive finding was defined as any expert opinion of the study describing a focal lesion: suspected abscess, cyst, hemangioma, liver metastases, primary malignant liver tumours, or other. According to the US scan and CT data, LA more commonly affected the right hepatic lobe ($p < 0.001$). The rate of positive findings of radiological examinations and affected hepatic lobes are shown in Table 3.

Table 2. Comparison of the baseline and follow-up values of the laboratory parameters

Laboratory parameter	Sample size (n) and median values				*p*
	n	Baseline (IQR)	n	Follow-up (IQR)	
WBC count, ×10³/µL	95	13.7 (11.1–19.5)	92	7.8 (5.8–10.0)	< 0.001
CRP, mg/L	95	196.4 (124.3–273.8)	93	29.3 (13.1–47.8)	< 0.001
ALT, U/L	92	35.5 (22.0–80.4)	72	19.4 (12.1–33.8)	< 0.001
AST, U/L	78	38.5 (20.4–71.4)	60	20.8 (16.1–32.1)	< 0.001
Total bilirubin, µmol/L	86	15.4 (7.9–23.5)	72	7.1 (4.9–10.2)	< 0.001
Conjugated bilirubin, µmol/L	85	8.0 (4.4–17.9)	72	3.8 (2.3–5.7)	< 0.001
PCT, ng/mL	72	2.3 (0.5–25.1)	52	0.5 (0.2–1.2)	< 0.001
ALP, U/L	40	169.6 (111.4–335.4)	17	94.2 (76.0–152.0)	0.109
GGT, U/L	28	112.1 (74.2–160.2)	12	131.7 (66.6–211.4)	1
ESR, mm/h	20	41.5 (31.8–51.8)	6	66.0 (44.0–76.5)	0.028

ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; GGT, gamma glutamyltransferase; PCT, procalcitonin; WBC, white blood cell [count]

Table 3. Rate of positive findings of radiological investigations and affected hepatic lobe(s)

Radiological technique	Number of cases investigated (n) and findings							*p*
	n	Positive finding, % (n)	Affected hepatic lobe, % (n)					
			right	left	both	central	*lobus caudatus*	
Ultrasound	90	91.1 (82)	69.1 (56)	18.5 (15)	8.6 (7)	2.5 (2)	1.2 (1)	< 0.001
Computed tomography	70	100 (70)	62.7 (42)	14.9 (10)	20.9 (14)	0 (0)	1.5 (1)	< 0.001
Magnetic resonance	4	100 (4)	0 (0)	75.0 (3)	25.0 (1)	0 (0)	0 (0)	< 0.625

In the US scans and CT investigations, solitary LA were found convincingly more common, 76.8% ($p < 0.001$) and 67.1% ($p = 0.006$) of cases, respectively. The median size of the largest abscess on the US scan was 6.0 cm (IQR 5.0–8.0), on CT — 6.7 cm (IQR 5.0–8.2). The number of radiologically identified abscesses and their characteristics are seen in Table 4.

When comparing the efficacy of the US scan and CT (Table 5), no statistically significant differences were found, either in the context of the affected hepatic lobe or in the number of abscesses.

Blood culture test was performed in 43 patients, with a positive result of 48.8% (n = 21), while 9.3% (n = 4) of samples may had been contaminated, defined as a positive result of cultivation in only one of the four tubes. Abscess material for cultivation was taken in 70 patients, with a positive result for 88.6% (n = 62) of cases. Microbiological data of blood samples and abscess had coincided with at least one microorganism in 73.3% (n = 11) of cases. According to microbiological investigations of the LA, only one agent was isolated in 67.7% (n = 42) of cases. General data for blood samples and abscess material are shown in Table 6.

The most frequently isolated microorganism from blood and LA samples was *Klebsiella pneumoniae*, 47.6% (n = 10) and 40.3% (n = 25) of cases, respectively. In 22.6% (n = 14) of cases of LA material *Escherichia coli* was detected; anaerobes such as *Fusobacterium* spp. and *Prevotella* spp. were identified in 30.6% (n = 19) of cases, while streptococci in 29% (n = 18). *K. pneumoniae* was statistically more likely to be present in monomicrobial abscesses, while *E. coli* in polymicrobial LA (χ^2 (1, n = 39) = 5.61, $p = 0.018$). Detailed relations of microorganisms isolated from blood samples and LA material are given in Table 7 and Figure 2.

Table 4. Number of radiologically identified liver abscesses and their characteristics

| Radiological technique | n | Number of identified liver abscesses (n) and their characteristics | | p | Median size of the largest abscess, cm (IQR) |
| | | Number of liver abscesses, % (n) | | | |
		solitary	multiple		
Ultrasound	82	76.8 (63)	23.2 (19)	< 0.001	6.0 (5.0–8.0)
Computed tomography	70	67.1 (47)	32.9 (23)	0.006	6.7 (5.0–8.2)
Magnetic resonance	4	75.0 (3)	25.0 (1)	0.625	6.0 (1.0–N/A)

N/A, not applicable

Table 5. Affected hepatic lobe and number of abscesses identified by ultrasound scan and subsequent computed tomography, stratified data

| Radiological technique | n | Number of cases investigated (n) and findings | | | | n | | |
| | | Affected hepatic lobe, % (n) | | | | | Number of abscesses, % (n) | |
		right	left	both	*lobus caudatus*		solitary	multiple
Ultrasound		65.5 (38)	20.7 (12)	12.1 (7)	1.7 (1)		77.0 (47)	23.0 (14)
Computed tomography	58	60.3 (35)	13.8 (8)	24.1 (14)	1.7 (1)	61	62.3 (38)	37.7 (23)
p		0.294					0.113	

Table 6. General microbiological data of blood samples and abscess material

| Sample investigated | n | Number of samples investigated (n) and findings | | | | | p |
| | | Positive finding, % (n) | Similar finding, % (n) | Number of isolates, % (n) | | | |
				1	2–3	4+	
Blood	43	48.8 (21)	73.3 (11)	81 (17)	19 (4)	0 (0)	< 0.001
Abscess material	70	88.6 (62)		67.8 (42)	16.1 (10)	16.1 (10)	< 0.001

Table 7. Microorganisms isolated from blood samples and liver abscess material, stratified by number of agents detected

| Microorganism | n | Number of blood samples (n) and agents | | n | Number of corresponding liver abscess materials (n) and agents | | p |
| | | Number of agents, % (n) | | | Number of agents, % (n) | | |
		1	2+		1	2+	
Klebsiella pneumoniae	10	100 (10)	0 (0)	25	68.0 (17)	32.0 (8)	< 0.108
Escherichia coli	4	100 (4)	0 (0)	14	28.6 (4)	71.4 (10)	< 0.180
Enterococcus spp.	0	0 (0)	0 (0)	7	28.6 (2)	71.4 (5)	< 0.453
Aerobic, microaerophilic and anaerobic streptococci	3	66.7 (2)	33.3 (1)	18	55.6 (10)	44.4 (8)	< 0.815
Anaerobes	2	0 (0)	100 (2)	19	42.1 (8)	57.9 (11)	< 0.648
Other	6	50.0 (3)	50.0 (3)	9	0 (0)	100 (9)	< 0.004
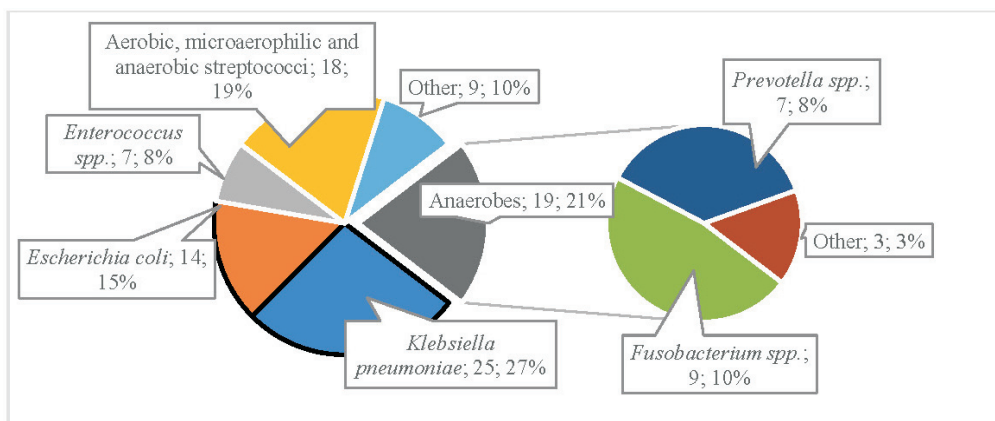
Fig. 2. Microorganisms isolated from liver abscess material, stratification by number of cases.

Natural resistance of *K. pneumoniae* to ampicillin was identified from the microbiological data. Multidrug resistant pathogens were isolated from LA material in nine cases, including β-lactamase producing *K. pneumoniae* and / or *E. coli* in four cases, AmpC producing *Citrobacter* spp. in two cases and multidrug resistant strains of *Enterococcus* spp. in three cases.

Data of the treatment modalities. Antimicrobial therapy was administered to 97.9% (n = 93) of patients, one patient with abscess relapse in the first post-treatment month was treated with minimally invasive drainage technique alone, while one patient had *exitus lethalis* before any treatment was initiated. Intravenous formulations of ceftriaxone and metronidazole were used as the principal antimicrobial combination in stationary conditions in 35.5% (n = 33) of cases. Median overall expected duration of antimicrobial treatment was 15 days (IQR 11–23). During hospitalisation the median number of trial combinations of antimicrobials per patient was 2 combinations (IQR 1–3).

LA drainage was performed in 87.4% (n = 83) of cases, of which 88.0% (n = 73) of percutaneous technique attempts were successful ($p < 0.001$), while 8.4% (n = 7) of percutaneous drainage attempts were subjected to subsequent surgical drainage due to the lack of positive dynamics. The median duration of drainage was 7 days (IQR 6–10.75). LA drainage was not performed in cases where the abscess was defined as small, did not have any liquid component, or in some cases where percutaneous drainage had failed technically. The combination of antimicrobial and invasive approaches was applied in 86.3% (n = 82) of cases.

The median time of defervescence after initiation of antimicrobial therapy was eight days (IQR 3–12, n = 62).

DISCUSSION

According to the results of the study, the mean age of patients with LA without gender stratification was 64.9 ± 15.9 years, which corresponds to the information provided by several other European, US and Asian studies (Rahimian *et al.*, 2004; Bosanko *et al.*, 2011; Tian *et al.*, 2012; Romano *et al.*, 2013), where the average patient's age was 64.7 ± 17 years, 56.4 years, 58 years and 63.8 ± 15.7 years, respec-

tively. Overall, studies have shown that patient's age over 55–57 years is an independent risk factor for the development of LA.

The study carried out did not reveal a statistically significant gender difference (male to female ratio = 1.1 : 1) previously described by Lee *et al.* (2001), Lin *et al.* (2009) and Pang *et al.* (2011). These studies showed that pyogenic LA is approximately twice as common in men compared to women. The data mismatch may be associated with a smaller base for our study, as well as a randomised form of data selection, rather than an analysis of all available cases for a given period.

The range of potential signs of LA observed in the study and their incidence rates, particularly in terms of fever (77.9%) and discomfort and/or abdominal pain (69.5%), are consistent with other reports. For example, in a study conducted by Chen *et al.* (2014), 88.1% of patients were found to have increased body temperature and 85.2% had pain in right upper quadrant, while Ferraioli *et al.* (2008) study showed that 89.9% of patients experienced increased body temperature and 39.9% — abdominal pain at the time of hospitalisation. The meta-analysis of LA conducted by Lübbert *et al.* (2014) showed an average of 89.6% of cases with elevated body temperature and 72.2% for right upper quadrant pain. It should be noted that the acquisition of accurate results significantly depends on individual circumstances: the studies examined do not specify whether the information regarding increased body temperature was observed only objectively or whether the patient's provided information was taken into consideration as well. The studies also differ in the assessment of pain, whether only right upper quadrant pain cases were included or other localisation of abdominal pain as well.

Following the results of our study, elevated PCT (100%), CRP (98.9%), total WBC count (86.3%), GGT (85.7%), ALP (67.5%,) and conjugated bilirubin (63.5%) levels were the most common abnormalities found in the baseline laboratory investigations. Elevated AST and ALT levels were found in the baseline data in 51.3% and 43.5% of cases, respectively. This data is partially consistent with that provided by Pang *et al.* (2011), where the most common laboratory findings were increased inflammation, such as total WBC count and CRP level, and cholestatic markers, that is

GGT, ALP, bilirubin fractions; however, in that study hepatic transaminases suggestive of cytolysis were increased in a higher number of patients (AST – 67%, ALT – 73%).

In addition to the changes in the above-mentioned laboratory parameters, the ESR change also was statistically significant. Our study showed an increase in ESR (41.5 mm/h → 66.0 mm/h), which was expected based on the slow ESR acute-phase response. The return of the ESR within the reference interval is expected within weeks to months following an acute inflammation (Osei-Bimpong *et al.*, 2007).

Information obtained from radiological studies on the increased incidence of solitary LA compared to multiple abscess, as well as localisation predominantly in the right hepatic lobe, is entirely consistent with the data provided by Pang *et al.* (2011), Chen *et al.* (2014) and Chang *et al.* (2015). According to Albuquerque *et al.* (2011), the predilection of the right hepatic lobe is due to anatomical features. *Vena mesenterica superior* and *vena portae* participate in the blood supply of the right hepatic lobe, while the left lobe receives blood from *vena mesenterica inferior* and *vena splenica*. In addition, there is an anatomically denser network of biliary channels in the right lobe, and overall, the right hepatic lobe constitutes a larger amount of liver weight.

The microbiological analyses identified only pyogenic LA bacteria predominantly due to *K. pneumoniae*. These data are consistent with Asian studies (Wong *et al.*, 2002; Rahimian *et al.*, 2004; Siu *et al.*, 2012; Romano *et al.*, 2013), but do not correspond to a number of European, US and Australian studies (Pastagia and Arumugam, 2008; Moore *et al.*, 2013; Chavada *et al.*, 2014), where the dominant aetiological agent of LA is considered to be *E. coli*. This difference could be explained by a lack of previous extensive studies in the Baltic States, as well as a relatively low population size for this study. It should also be noted that in a previous study, 16.8% of patients were identified to have concomitant diabetes mellitus, which is a proven independent risk factor for the development of LA due to *K. pneumoniae* (Mavilia *et al.*, 2016).

Our study showed that, in line with the international recommendations (Mavilia *et al.*, 2016), the cornerstone of LA therapy in Rīga East University Hospital clinical centre "Gaiļezers" is the combination of antimicrobials. In non-intensive care units most commonly a combination of ceftriaxone and metronidazole is used, in the intensive care units — piperacillin/tazobactam or imipenem/cilastatin, and drainage techniques (86.3%). According to international recommendations, the choice of antimicrobials had been most often appropriate, taking into account the overall condition of the patient and the clinical course of the disease, but the median overall expected duration of antimicrobial treatment, not less than 4–6 weeks (Carpenter and Gilpin, 2017), did not comply with these recommendations, possibly due to insufficient importance of the issue at the national level.

CONCLUSIONS

1. The peak incidence of liver abscesses was in the patients' seventh decade of age.

2. The most common risk factors for the development of liver abscesses were underlying biliary tract abnormalities, including a history of surgery, diabetes mellitus and chronic pancreatitis.

3. Patients with complaints of fever, abdominal pain or discomfort and malaise in conjunction with elevated procalcitonin, C-reactive protein, total white blood cell count, gamma-glutamyl transferase, alkaline phosphatase and conjugated bilirubin levels should be further actively investigated to exclude possible liver abscess, as hepatic transaminases indicative of cytolysis may remain normal in up to half of cases.

4. The main radiological methods to visualise liver abscess were ultrasound scan and computed tomography, with both methods providing largely equivalent data.

5. *Klebsiella pneumoniae* and *Escherichia coli* were the most common isolated pathogens, accounting for more than half of all microbiologically confirmed cases of liver abscesses.

6. The most used antimicrobial regimen in the hospital, consistent with international guidelines, was a combination of intravenous formulations of ceftriaxone and metronidazole, but the duration of treatment was often insufficient.

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AKNU ABSCESI — VIENA LATVIJAS DAUDZPROFILU STACIONĀRA 7 GADU PIEREDZE

Pasaules medicīnas literatūrā aknu abscess ir labi apzināta un plaši aprakstīta nozoloģiska vienība. Savukārt Latvijā šobrīd nav nozīmīga apjoma datu par pacientiem ar aknu abscesiem, tādēļ šis retrospektīva tipa pētījums, kas veikts vienā no lielākajiem stacionāriem Latvijā, var sniegt nozīmīgu informāciju par šo pacientu grupu, par iespējamajiem slimības attīstības riska faktoriem, diagnostikas un ārstēšanas īpatnībām, kas savukārt ļautu izdarīt secinājumus un dotu iespēju veikt nepieciešamās izmaiņas, lai uzlabotu darbu ar šiem pacientiem. Pētījuma rezultātā konstatēts, ka aknu abscesu incidences pīķis ir pacientiem septītajā desmitgadē. *Klebsiella pneumoniae* un *Escherichia coli* bija visbiežākie no kultūrām izdalītie patogēni, kas konstatēti vairāk nekā pusē mikrobioloģiski apstiprināto aknu abscesu gadījumu. Antimikrobiālās terapijas ilgums pētījumā iekļauto aknu abscesu gadījumos bieži neatbilda tā brīža starptautiskām rekomendācijām.

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