**Table 1. Clinical and demographic characteristics of the patients with ductal carcinoma of the pancreatic head and liver metastases, who have undergone pancreatoduodenectomy**

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| **Parameter, N (%) / Me [Q1; Q3]** | **PD with liver resection (M1), n = 21** | **PD without liver resection (M0), n = 469** | **P values** |
| Gender |  |  |  |
| Male | 11 (52.4) | 204 (43.5) | 0.422 |
| Female | 10 (47.6) | 265 (56.5) |
| Age, years | 59 [53; 65] | 62 [57; 67] | 0.154 |
| Body mass index, kg/m2 | 25 [23; 27] | 25 [22; 28] | 0.999 |
| Tumor size: |  |  |  |
| Т1 | 0 (0.0) | 19 (4.1) | 0.492 |
| Т2 | 3 (14.3) | 121 (25.8) |
| Т3 | 18 (85.7) | 314 (67.0) |
| Т4 | 0 (0.0) | 15 (3.2) |
| Regional metastases: |  |  |  |
| N0 | 9 (42.9) | 232 (49.5) | 0.821 |
| N1 | 11 (52.4) | 206 (43.9) |
| N2 | 1 (4.8) | 31 (6.6) |
| ECOG score: |  |  |  |
| 0–1 | 18 (85.7) | 335/371\* (90.3) | 0.453 |
| 2–3 | 3 (14.3) | 36/371\* (9.7) |
| ASA score: |  |  |  |
| 1–2 | 21 (100.0) | 303/371\* (81.7) | 0.033 |
| 3 | 0 | 68/371\* (18.3) |
| Diabetes mellitus, not on insulin treatment | 2 (9.5) | 61/371\* (16.4) | 0.550 |
| Diabetes mellitus, on insulin treatment | 1 (4.8) | 28/371\* (7.5) | > 0.999 |
| CHD | 5 (23.8) | 110/371\* (29.6) | 0.806 |
| CHD, angina pectoris | 4 (19.0) | 73/371\* (19.7) | > 0.999 |
| CHD, post-infarction cardiosclerosis | 1 (4.8) | 20/371\* (5.4) | > 0.999 |
| CHD, heart arrhythmia | 0 (0.0) | 29/371\* (7.8) | 0.387 |
| Cerebrovascular disease | 1 (4.8) | 15/371\* (4.0) | 0.593 |
| Arterial hypertension | 5 (23.8) | 210/371\* (56.6) | 0.006 |
| Obesity | 3 (14.3) | 65 (13.9) | > 0.999 |
| Anemia | 2 (9.5) | 37 (7.9) | 0.680 |
| Jaundice | 15 (71.4) | 358 (76.3) | 0.604 |
| Tumor histology: |  |  |  |
| Adenocarcinoma | 20 (95.2) | 450 (95.9) | 0.4 |
| Mucinous adenocarcinoma | 0 (0.0) | 10 (2.1) |
| Mixed cancer | 1 (4.8) | 4 (0.9) |
| Undifferentiated cancer | 0 | 4 (0.9) |
| Colloid cancer | 0 | 1 (0.2) |
| Tumor differentiation grade: |  |  |  |
| G1 | 3 (14.3) | 51 (11.6) | 0.021 |
| G2 | 11 (52.4) | 334 (75.7) |
| G3 | 7 (33.3) | 56 (12.7) |
| Retroperitoneal invasion | 16 (76.2) | 235 (50.1) | 0.024 |
| Perineural invasion | 9/15\* (60.0) | 315/456\* (69.1) | 0.571 |
| Venous invasion | 5/19\* (26.3) | 74/468\* (15.8) | 0.212 |
| Vein resection | 5 (23.8) | 97 (20.7) | 0.783 |
| Definitive surgery: |  |  |  |
| R0 | 16 (76.2) | 353 (75.3) | 0.263 |
| R1 | 3 (14.3) | 99 (21.1) |
| R2 | 2 (9.5) | 17 (3.6) |
| Pancreatic density: |  |  |  |
| Soft | 3 (14.3) | 138 (29.4) | 0.216 |
| Dense | 18 (85.7) | 331 (70.6) |
| Duct diameter, cm | 0.4 [0.3; 0.5] | 0.5 [0.3; 0.6] | 0.221 |
| Neoadjuvant chemotherapy | 2 (9.5) | 185 (39.4) | 0.005 |
| Adjuvant chemotherapy | 15 (71.4) | 326 (69.5) | > 0.999 |
| СА 19-9, U/mL | 803 [349; 1600] | 77.1 [28.2; 241.4] | < 0.001 |

ASA, American Society of Anesthesiologists; CHD, coronary heart disease; ECOG, Eastern Cooperative Oncology Group; Me, median; PD, pancreatoduodenectomy; Q1, 1st quartile; Q3, 3rd quartile

\* Data was obtained not for all patients

**Table 2. Liver metastases characteristics in the patients having undergone pancreatoduodenectomy with liver resection (n = 21)**

|  |  |
| --- | --- |
| **Parameter** | **Patient numbers, N (%)** |
| Number of metastases: |  |
| 1 | 12 (57.1) |
| 2 | 7 (33.3) |
| 3 | 1 (4.8) |
| 4 | 1 (4.8) |
| Metastasis location: |  |
| Right lobe | 7 (33.3) |
| Left lobe | 13 (61.9) |
| Both lobes | 1 (4.8) |
| Maximal diameter: |  |
| Up to 1 cm | 15 (71.4) |
| More than 1.1 cm | 6 (28.6) |

**Table 3. Short-term surgery outcomes in the study groups**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter, N (%) / Me [Q1; Q3]** | **PD with liver resection (M1), n = 21** | **PD without liver resection (М0), n = 469** | **P value** |
| Clavien – Dindo complication grade: | 12 (57.1) | 310 (66.1) | 0.481 |
| 1 | 2 (9.5) | 65 (13.9) | – |
| 2 | 0 | 112 (23.9) |
| 3a | 7 (33.3) | 100 (21.3) |
| 3b | 2 (9.5) | 12 (2.6) |
| 4 | 0 | 2 (0.4) |
| 5 | 1 (4.8) | 19 (4.1) |
| Biliodigestive anastomosis leak | 2 (9.5) | 28 (6.0) | 0.373 |
| Pancreonecrosis | 0 | 3 (0.6) | > 0.999 |
| Intestinal fistula | 1 (4.8) | 8 (1.7) | 0.331 |
| Intraabdominal abscess | 4 (19.0) | 10 (2.2) | 0.002 |
| Surgical bleeding | 1 (4.8) | 31 (6.7) | > 0.999 |
| Gastric ulcer bleeding | 1 (4.8) | 32 (6.9) | > 0.999 |
| Pancreatic fistula, ISGPF type (2016): | 7 (33.3) | 82 (17.5%) | 0.08 |
| BL | 1 (4.8) | 8 (1.7) | – |
| В | 5 (23.8) | 67 (14.3) |
| С | 1 (4.8) | 7 (1.5) |
| Relaparotomy | 3 (14.3) | 21 (4.5) | 0.077 |
| Pneumonia | 1 (4.8) | 16 (3.4) | 0.531 |
| Diabetes mellitus | 1 (4.8) | 34 (7.2) | > 0.999 |
| Gastroparesis | 6 (28.6) | 172 (36.7) | 0.498 |
| Blood loss, mL | 700 [300; 1200] | 500 [250; 1120] | 0.354 |
| Death | 1 (4.8) | 19 (4.1) | 0.591 |

ISGPF, International Study Group on Pancreatic Fistula; Me, median; PD, pancreatoduodenectomy; Q1, 1st quartile; Q3, 3rd quartile