ABSTRACT

Conjoining the major pancreatic and common bile duct at the major duodenal papilla (MDP) is suspected to predispose cats to the clinical syndrome of “triaditis.” However, the pathogenesis is poorly understood and presence of pathology at the MDP has not been assessed in cats with or without triaditis. Our aim was to identify any association between MDP anatomy or pathology and presence of biliary, pancreatic, or intestinal inflammation or neoplasia. Histologic assessment was performed on duodenum, liver, pancreas, jejunum, and ileum from 82 cats presented for postmortem examination. The majority of cats (63%, 6/82) had a complex ductular network at the MDP with no distinction between pancreatic and common bile ducts. Lymphoid aggregates at this site were common (46%, 38/82). Inflammation of the MDP was present in 30% of cats (25/82), and was frequently associated with cholangitis, pancreatitis, or enteritis (52%, 23/45). Cholangitis (29%, 4/82), pancreatitis (65%, 54/82), and enteritis (42%, 37/82) were common, but none were individually associated with inflammation at the MDP. Triaditis was less common (13%, 11/82), but in 3/11 had concurrent inflammation at the MDP. Neoplasia was present in 23% of cats (20/82), and was associated with lymphoma and metastatic disease at the MDP. These findings suggest that immune activation or inflammation of the MDP may play a role in the pathogenesis of triaditis and facilitate local metastasis of neoplasia in cats.

INTRODUCTION

Concurrent pancreatitis, cholangitis, and enteritis, colloquially referred to as “triaditis,” can cause significant morbidity in feline patients, but the pathogenesis of this clinical syndrome is not fully understood and antemortem diagnosis can be challenging, often relying on histologic examination of all tissues for a definitive diagnosis. Inflammation in these organs can often be subdivided by the type of inflammatory infiltrate, with either suppurative or lymphoplasmacytic inflammation being most common. The former is often associated with bacterial infection, but the pathogenesis of the latter is largely unknown. In either case, cats are thought to be predisposed to “triaditis” due to the anatomy of their major duodenal papilla, in which the common bile duct and pancreatic duct conjoin at the Ampulla of Vater prior to entering the duodenum (Figure 1). However, histologic characterization of this anatomic location has not been previously reported in a large population of cats, and therefore, histology of this location has not been assessed in cats with or without histologic evidence of triaditis.

OBJECTIVES and HYPOTHESES

1. Characterize the histologic anatomy of the major duodenal papilla in cats
   • HYPOTHESIS: The majority of cats will exhibit joining of pancreatic and common bile ducts prior to entry into the duodenum
2. Histologically assess the major duodenal papilla and associated organs (liver, pancreas, and intestines) for the presence of inflammation and/or neoplasia
   • HYPOTHESIS: Cats with concurrent inflammation in liver, pancreas, and small intestine will also have cellular infiltrates at the major duodenal papilla

RESULTS

Figure 2. A complex ductular network is common at the duodenal papilla. The majority (63%, 6/82) of cats have a complex ductular network at the major duodenal papilla (A) rather than two distinct separate ducts (B).

Figure 3. Prominent lymphoid tissue is common at the duodenal papilla. Prominent lymphoid follicles are present near or within the major duodenal papilla in nearly half of cats (38/82, 46%).

Figure 4. Cats with inflammation or neoplasm in the pancreas, biliary tree, or intestine often have concurrent inflammation or metastatic neoplasia in other organs, including the major duodenal papilla (MDP). A) Example cat with suppurative pancreatitis and cholangitis have concurrent suppurative major duodenal papilla. B) Example cat with moderate to marked chronic lymphoplasmacytic pancreatitis and cholangitis with concurrent chronic lymphoplasmacytic enteritis and extension of fibrosis to the major duodenal papilla. C) The majority of cats with inflammation in examined organs had mild, chronic lymphoplasmacytic inflammation in multiple organs. Notably, in multiple of these cats, there was evidence of transition to an enteropathy type lymphoma in the intestine (not pictured). The example cat has mild lymphoplasmacytic inflammation in all four tissues. D) Example cat with enteropathy type lymphoma with concurrent spread to the pancreas and liver. In this case, it was unclear if lymphoid aggregates in the major duodenal papilla represented metastatic disease or lymphoid tissue reactive. E) In one unique case, a cat had a carcinoma in the common bile that resulted in biliary obstruction with chronic lymphoplasmacytic cholangitis as well as a concurrent mild to moderate lymphoplasmacytic to eosinophilaric pancreatitis, enteritis, and major duodenal papilla. Neoplasia of major duodenal papilla: IP—lymphoplasmacytic inflammation, CBD—common bile duct

Figure 5. There is no association between major duodenal papilla inflammation and metastasis to other organs. Major duodenal papilla is identified in 30% of 23/82 of cats, and is often present in conjunction with pancreatitis, enteritis, or cholangitis. However, there is no significant association (p=0.67, Chi-square test) between inflammation at the MDP and any of these organs.

Figure 6. “Triaditis” is uncommon but is often associated with major duodenal papilla inflammation. Increased severity of inflammation in prominent pancreas, small intestine, and liver, with common concurrent inflammation in triaditis cats. However, there is no significant association (p=0.03, Chi-Square test) between inflammation in any two organs. “Triaditis” was identified in 11 cats, 6 of which had concurrent major duodenal papilla.

Figure 7. Neoplasia arising from liver, pancreas, or intestine occurs in conjunction with inflammation and/or metastasis in other organs. Neoplasia was present in at least one examined tissue in 25/82 cats (24%), with lymphoma being the most common neoplasm (n=15). Of these cats, 9/20 had concurrent inflammation or metastasis in liver, pancreas, and intestine, while a further subset of 6/20 additionally had inflammation or metastasis at the major duodenal papilla.

DISCUSSION and FUTURE DIRECTIONS

• Proposed areas of further investigation include:
  • Association between histologic findings, clinical history, and clinicopathologic data
  • Scoring of inflammation by severity and type of inflammatory and/or neoplastic infiltrate
  • Immunohistochemical staining to characterize histogenesis of epithelial cells at MDP
  • Association between chronic inflammation and the development of neoplasia in these organs
  • Searching for underlying causes for inflammation and immune stimulation at the MDP
  • Lymphoid follicles suggests importance of immune surveillance
  • Characterization of gut and bile flora via FISH and deep sequencing

This study underscores the importance of histologic assessment of pancreas, liver, intestine, and the major duodenal papilla in work-up of hepatobiliary and gastrointestinal diseases in feline patients.

CONCLUSIONS

• The majority of cats have a complex network of merging ducts at the MDP (Ampulla of Vater)
• Lymphoid follicles are common at the MDP
• Pancreatitis is common in cats, confirming previously reported findings in cats, and is often present in conjunction with pancreatitis, enteritis, or cholangitis. Approximately ½ of cats with neoplasia in the liver, pancreas, or intestine often have concurrent inflammation or metastasis in other organs, including the MDP

REFERENCES

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3. N=82 cats
4. Age Range: 2 months – 19 years (Mean=10.44 years old)
5. Multiple breeds represented at diagnosis
6. Common concurrent pathological findings
7. Tissues examined include liver, pancreas, duodenum and ileum (Figure 1)
8. Tissues were fixed in formalin and routinely processed for microscopic evaluation

MATERIALS and METHODS

1. HISTOLOGIC CHARACTERIZATION OF THE MAJOR DUODENAL PAPILLA OF CATS AND CORRELATION TO THE INCIDENCE OF CONCURRENT HEPATIC, PANCREATIC, AND INTESTINAL INFLAMMATION AND NEOPLASIA

Megan E. Schreep1, John M. Cullen1,2, Jody L. Gookin1

1. North Carolina State University College of Veterinary Medicine, Raleigh, NC 2. Experimental Pathology Labs, Morrisville, NC

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