

Antireflux Valve in Post Cholecystojejunostomy Cholangitis: An Animal Study

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Abstract

Background: One of the most important post-operation problems encountered with Hepaticojejunostomy (Kasai operation) in patients with biliary atresia is cholangitis. The aim of this study was to evaluate the efficiency of anti-reflux valve in decreasing the incidence of cholangitis after hepaticojejunostomy.

Methods: Ten dogs were randomly divided into two groups of equal size. In group A Roux-en-Y cholecystojejunostomy was performed and in group B antireflux valve was also added. Three months later, liver biopsy was taken to evaluate histopathologic changes.

Results: The incidence of cholangitis was significantly reduced in dogs in which anti-reflux valve procedure was performed.

Conclusions: Anti-reflux valve procedure effectively decreased post-Roux-en-Y cholecystojejunostomy cholangitis in dogs. Therefore it is plausible and might be beneficial for patients being treated for biliary atresia.

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Keywords • Cholangitis • Kasai operation • antireflux valve • Roux-en-Y cholecystojejunostomy

Introduction

Ascending cholangitis is the most common complication of hepatic portoenterostomy (Kasai operation) in patients with biliary atresia (BA), with rates reported as much as 60-100 percent.^{1,2} Cholangitis has a negative impact on long-term outcome and prognosis of children with BA.^{1,3} It is occasionally due to retrograde flow of bacterial flora into the drainage loop and to the portohepatis.^{1,3} Dilatation of the intrahepatic bile ducts is also a predisposing factor.⁴ Several methods have been considered to control and prevent cholangitis in patients with BA.¹⁻⁸ One of the most important methods, which was advocated by Nakajo and colleagues is the addition of an intussusception-type antireflux valve into the bilioenteric conduit.⁸

Several animal and clinical studies have been done to evaluate the efficacy of Nakajo's method.^{8-10,13} However, the value of this method is still in doubt. In this study, we evaluated the efficacy of antireflux valve in preventing post-cholecystojejunostomy Roux-en-Y cholangitis in dogs.

Material and Methods

The study was approved by the Ethical Committee of Shiraz

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University of Medical Sciences. In this randomized experimental trial, 10 dogs, hybrid race of both sexes were divided into two groups of equal size. In group A Roux-en-Y cholecystojejunostomy was performed without the antireflux procedure. Group B underwent both cholecystojejunostomy and antireflux valve procedure (Nakajo operation).

A blood sample for CBC and liver function test (LFT) was taken prior to euthanasia. Two biopsies were taken from the liver (for pathological studies and culture) and one from the jejunostenostomy. A sample from the Roux-en-Y limb fluid content was also obtained and sent for bacterial culture.

Surgical Technique

After induction of anesthesia with 17 mg/kg of IV sodium thiopental (Pentotal, Abbot, Sweden), endotracheal intubation (tube number 7.5-8) was done. Anesthesia was maintained with oxygen and 5% halothane. IV ampicillin, 50mg/kg qid (Haiian, Iran) and gentamicin, 3mg/kg tid (Haiian, Iran), were given during the operation and for two days afterwards. A blood sample for liver function tests (LFT) and White blood count (WBC) was taken prior to the incision. Through a midline longitudinal laparotomy incision the abdominal cavity was opened. Then a wedge biopsy from the liver was taken and sent for culture. Then in both groups the jejunum was transected from 15 cm distal to the ligament of Treitz. A 2-3 cm incision was made over the fundus of gall bladder.

The distal end of jejunum was then anastomosed, with Vicryl 4-0 in one layer simple separate sutures, to the gallbladder. The proximal end of the jejunum was also anastomosed end to side, with Prolene 4-0 in one layer; Gambee method, to the distal limb of the jejunum approximately 45 cm distal to the cholecystojejunostomy.

Furthermore, in group B antireflux procedure was performed as the following. The mesenteric vessels were ligated and transected for four cm near the intestinal wall and its distal two cm was further denuded of its seromuscular layer. Afterwards, the intussuscepted valve was created in the denuded jejunal segment by invaginating the proximal portion into the distal limb of the Roux-en-Y. The animal was kept NPO for four days with 1000-1500 ml IV fluid followed by oral feeding with milk and finally regular diet.

Statistical analysis

Values are expressed as mean±SD. One way ANOVA and Fisher-Exact test was used for statistical analysis to compare the rate of cholangitis in two groups and $P<0.05$ was considered as statistically significant.

Results

The results of the experiment conducted on five dogs of each group, which stayed alive for three months, are presented. The clinical evaluation, pre- and post-operative laboratory data and the incidence of cholangitis in both groups are all shown in Table 1. They satisfactorily tolerated the diet and had good weight gain. Clinical condition and weight gain in dogs with antireflux procedure (group B) was better than dogs without the procedure (group A). Both groups had no evidence of jaundice and changes in stool color.

Table 1: Clinical and laboratory finding of group A compared with group B

	Surgery	Group A	Group B
Wt gain n (%)	After	3 (60)	5 (100)*
WBC range (x100/mm ³)	Before	68-95	76-90
	After	90-160	95-112
Ab-LFT n (%)	Before	0 (0%)	0 (0%)
	After	3 (60%)	0 (0%)
Positive liver culture n (%)		4 (80%)	1 (20%)*
Cholangitis n (%)		3 (60%)	0 (0%)*

Ab-LFT= Abnormal LFT: Elevated bilirubin, alkaline phosphatase and mild increase in liver enzymes (SGOT and SGPT). Cholangitis= peri-portal inflammation and polymorphonuclear infiltration;

*= $p<0.05$

As shown in Table 1, WBC was normal in both groups, whereas, liver function tests were abnormal in 60% of group A but none in group B. Liver bacterial cultures were positive in 80% of group A which was significantly higher than group B (20%). The liver biopsy showed more inflammation and signs of cholangitis in group A compared with group B.

The competence effects of the valves were evaluated by injecting saline distally after reconstruction and at the end of the experiment, after euthanasia. The valves remained competent and well prevented the reflux. The rate of post operative cholangitis was significantly lower in dogs of group B compared to group A.

Discussion

Cholangitis is one of the most common complications associated with the Kasai procedure. In spite of successful procedure cholangitis can significantly decrease the survival rate in patients with BA.¹ Several medical treatments including prolong antibiotic therapy and corticosteroid administration have been suggested to prevent cholangitis.^{5,6} However, cholangitis still remains a significant problem in these patients.

Komuro and colleagues have demonstrated that there is no relationship between the operation method and cholangitis,¹⁰ however, the reflux of intestinal content-bacteria into the biliary tree could be a plausible etiology for this complication.⁸ Hence, many surgeons have

innovated different methods in preventing reflux to decrease the rate of cholangitis.^{1,3,8,9}

In this experimental animal study, antireflux valve procedure was performed using the method of Nakajo et al.⁸ To exclude the factors associated with BA, cholecystojejunostomy was done to evaluate the effectiveness of this method in decreasing the rate of cholangitis. The competent valve prevented the reflux and significantly decreased the rate cholangitis. This was similar to the findings of Shim et al.³ Some studies have used long-term antibiotic therapy along with the antireflux operation.¹¹

Reports have also indicated that the modified Kasai technique, using an intestinal conduit at least 40 cm length, in combination with long-term antibiotic prophylaxis decreased the rate of cholangitis in patients with biliary atresia.¹¹ However, no control group was used in their study and the results might be most probably due to the long-term antibiotic therapy.¹² In our experiment, antibiotic therapy continued for two days after the surgery to prevent operative sepsis and stopped thereafter. Therefore, the reduction rate of cholangitis observed in our study is due in fact to the competent valve.

Some studies have demonstrated that anti-reflux procedure could significantly decrease the rate of cholangitis only when it is not associated with intrahepatic bile duct cystic dilatation.^{10,13} However, in our study the dogs were healthy and had normal biliary ducts and we could not evaluate this feature.

This study also demonstrated that the clinical condition and weight gain in dogs with anti-reflux operation (group B) was much better than dogs without the procedure (group A). This observation has the support of other studies done in both animals and patients with BA mentioning its cause to be due to less bacterial reflux and infection.³

Conclusion

Anti-reflux valve procedure is able to effectively decrease the rate of cholangitis in dogs with Roux-en-Y cholecystojejunostomy. Therefore, it appears that the use of antireflux valve procedure may effectively reduce the incidence of post operative cholangitis in patients treated for biliary atresia.

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