

Preservation of an Aberrant Left Hepatic Artery During Laparoscopic Nissen Fundoplication

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ABSTRACT

Objective: Laparoscopic Nissen fundoplication is performed in neonates and children for significant gastroesophageal reflux. An aberrant left hepatic artery encountered during laparoscopic Nissen fundoplication makes dissection around the esophageal hiatus more difficult if the artery is not transected. Although some suggest division of the aberrant left hepatic artery, this is associated with risk of significant hepatic injury from ischemia. We routinely preserve the aberrant left hepatic artery and sought to determine (1) the incidence of aberrant left hepatic artery and (2) the results following preservation of the aberrant left hepatic artery.

Methods: Between January 2000 and October 2002, 195 laparoscopic Nissen fundoplications were performed. We documented intraoperative findings of each procedure, and reviewed postoperative radiographic studies and clinic visits.

Results: In 30 patients (15%), an aberrant left hepatic artery was identified. All dissections were performed laparoscopically with the Nissen fundoplication positioned cephalad to the aberrant left hepatic artery. Postoperatively, 2 patients (6%) have had evidence of wrap failure. The remainder of the patients has had normal radiographic studies or no clinical evidence of reflux during clinic visits.

Conclusion: During laparoscopic Nissen fundoplication in neonates and children, an aberrant left hepatic artery may be encountered in approximately 15% of patients. When an aberrant left hepatic artery is identified, it should be preserved to avoid the potential risk of hepatic ischemic injury.

Key Words: Laparoscopy, Fundoplication, Aberrant left hepatic artery.

INTRODUCTION

The aberrant left hepatic artery (ALHA) is an arterial branch off of the left gastric artery and courses through the gastrohepatic ligament that provides blood supply to the left lobe of the liver. The reported incidence ranges from 3% to 25%.¹⁻⁵ The importance and significance of an ALHA is greatest for liver transplantation and operations performed near the gastrohepatic ligament, including esophagogastrectomy, gastrectomy, gastric bypass, and antireflux procedures.²⁻⁸

Although recent laparoscopic reports have only identified transient liver enzyme elevations with transection of the ALHA,²⁻⁴ reports exist of significant hepatic necrosis and even mortality after ALHA transection during esophagogastrectomy and gastrectomy.^{6,7}

In the presence of an ALHA, hiatal dissection during antireflux procedures is more challenging. During laparoscopic fundoplication, preservation of the ALHA is optimal and can be accomplished with identification and meticulous dissection as reported in the adult literature.⁵ However, injuries to this artery have been reported in adults during laparoscopic reflux and gastric banding procedures with resultant transection of the artery.^{2,3} Although recent reports in adults have documented safe division of this artery due to excessive bleeding, we believe a potential risk exists of hepatic ischemia.

We routinely preserve the ALHA in children undergoing laparoscopic Nissen fundoplications. Based on the adult literature, we sought to determine the incidence of ALHA in children undergoing laparoscopic Nissen fundoplications and analyze intraoperative findings, surgical technique, and postoperative results.

METHODS

Between January 2000 and October 2002, 195 laparoscopic Nissen fundoplications were performed. We documented intraoperative findings of each procedure and reviewed postoperative radiographic studies and clinic visits.

All procedures were completed laparoscopically utilizing 5 ports ranging from 3mm to 5 mm. A 4-mm 30-degree

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scope was used in all cases. Gastrohepatic ligament dissection was performed using electrocautery, preserving the ALHA (**Figure 1**).

After the crural repair, the fundus is tunneled behind the esophagus and caudal to the ALHA. First, we ensure that enough dissection has been performed to create a loose 360-degree wrap. Then, the fundus is transposed from a caudal to cephalad position with regard to the ALHA. Again, we ensure that a loose wrap will be created before suture placement. Once we are satisfied with the wrap cephalad to the ALHA, 3 sutures are placed to complete a short (2-cm) Nissen fundoplication (**Figure 2**).

This study was reviewed and approved by the Colorado Multiple Institutional Review Board (COMIRB # 04-0769).

RESULTS

In 30 patients (15%), an ALHA was identified. Hiatal dissection was not affected in any of these patients. There were no injuries to the ALHA, and none were transected. All dissections were performed laparoscopically with the completed Nissen fundoplication positioned cephalad to the ALHA.

Postoperatively, 2 patients (6%) have had evidence of wrap failure. One patient had an intact wrap with some slippage of the stomach through the wrap, but no gastro-

esophageal reflux. The second patient had large volume reflux with a hiatal hernia requiring revision. The remaining patients have had normal radiographic studies or no clinical evidence of reflux on follow-up clinic visits. Moreover, no patient has had any clinical or radiographic evidence of distal esophageal stenosis due to a tight fundoplication.

DISCUSSION

In this series of 195 patients undergoing laparoscopic Nissen fundoplication, the incidence of ALHA was 15%. This correlates with the reported incidence in the literature of 3% to 25%.¹⁻⁵ The problem upon encountering an ALHA is determining whether it is an accessory or replaced left hepatic artery. Significant blood flow to the left lobe of the liver can arise from an ALHA and ligation of it can result in hepatic dysfunction, ranging from transaminase elevation to hepatic necrosis.^{2-4,6,7} In fact, during proximal gastric resection, if an ALHA is identified and poor collateral blood flow to the left lobe of the liver is suspected, then a left lobectomy has been advocated.⁷ During laparoscopic procedures, it is difficult to ascertain whether collateral blood flow to the left lobe of the liver would be sufficient if the ALHA is transected. Therefore, during laparoscopic procedures, preservation of the ALHA

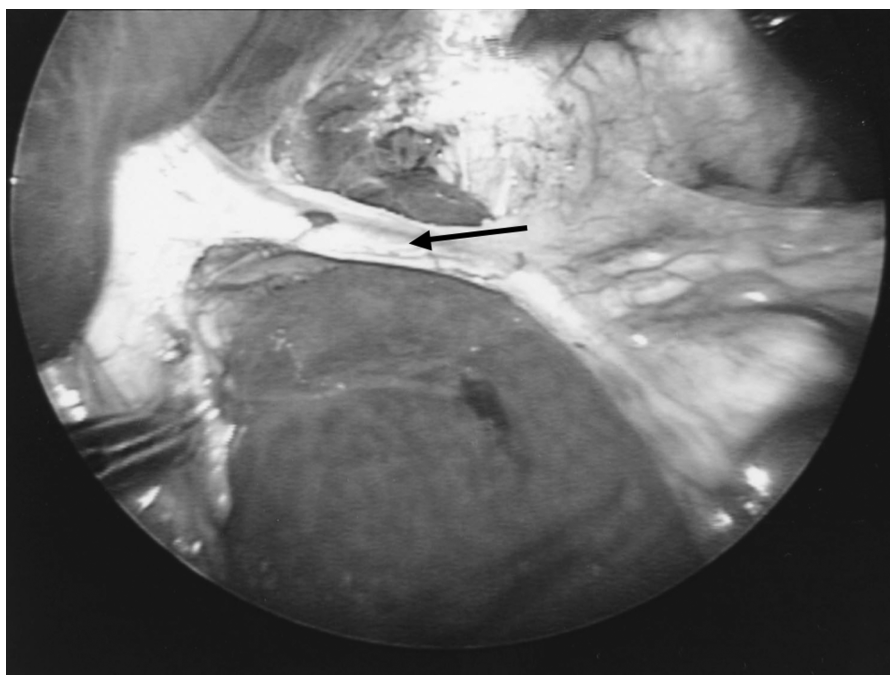


Figure 1. Gastrohepatic ligament dissection completed above and below an aberrant left hepatic artery (arrow).

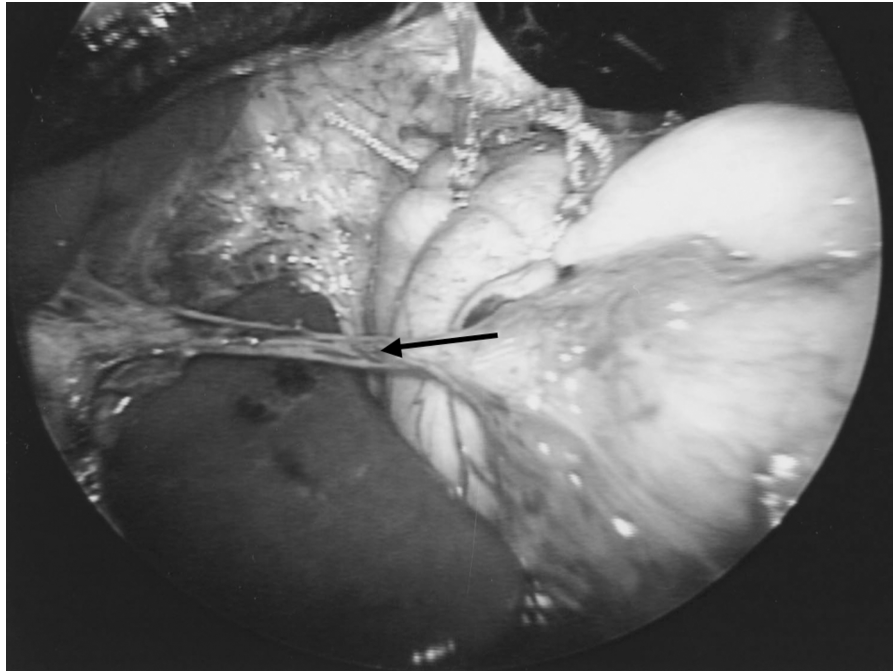


Figure 2. Nissen fundoplication positioned cephalad to an aberrant left hepatic artery (arrow).

is optimal because this artery may not be an accessory but rather an aberrant left hepatic artery.

In adults, laparoscopic funduplications are performed in the presence of an ALHA. One series⁵ reported no transection of the ALHA, while another series³ reported that 36% of the ALHA had to be transected due to difficulty with the hiatal dissection, injury to the artery, or ongoing bleeding. In children, preservation of an ALHA may prevent safe dissection of the esophageal hiatus and make placement of the fundoplication difficult. Unfortunately, no routine preoperative imaging studies are available that will delineate abnormal hepatic arterial anatomy. Routine imaging studies usually consist of an upper gastrointestinal study to delineate esophageal, gastric, and duodenal anatomy, and confirm reflux. Certainly, a celiac angiogram might demonstrate aberrant anatomy, but this is seldom used in children and has associated risks.

To date, the ability to preserve an ALHA during a fundoplication and the effect on the outcomes of the procedure has never been evaluated in children. During this series, we were able to preserve all ALHA encountered and perform the fundoplication safely with no intraoperative complications. If the artery is injured or sacrificed, then blood flow to the liver will be compromised. This may involve hepatic dysfunction ranging from transaminase

elevation to hepatic necrosis. Visualization of the ALHA is of utmost importance. Dissection of the gastrohepatic ligament cephalad and caudal to the ALHA must be done meticulously to establish adequate visualization of the ALHA and allow for placement of the fundoplication. We have not encountered any difficulty with placing the 2-cm wrap cephalad to an ALHA once adequate dissection has been performed.

Both the surgeon and the pediatrician routinely see the patients in follow-up, with radiographic studies performed based on clinical symptoms of recurrent reflux. Only 2 wrap failures (6%) in patients with an ALHA have occurred. One patient had an intact wrap with some slippage of the stomach through the wrap, but no gastroesophageal reflux. The second patient had large volume reflux with a hiatal hernia requiring revision. Our failure rate in patients with an ALHA is comparable to other published failure rates for laparoscopic Nissen funduplications in children.⁸

CONCLUSIONS

An aberrant left hepatic artery may be encountered in approximately 15% of children undergoing a laparoscopic Nissen fundoplication. With attentive identification, me-

ticulous dissection, and careful construction of the fundoplication, an ALHA may be routinely preserved. Functional results in our patients with an ALHA have not been significantly different from results in our patients without an ALHA. For this reason, we believe that an ALHA should routinely be preserved when performing a laparoscopic Nissen fundoplication in children.

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