

## Our trysts with the Duct of Luschka – A case series with Review of Literature

Ravi K Balar<sup>1</sup>, Abhijit S Joshi<sup>2</sup>

From, <sup>1</sup>Second year DNB Resident, <sup>2</sup>Consultant, Department of General and Laparoscopic Surgery, Dr. L. H Hiranandani Hospital, Hillside Avenue, Powai, Mumbai, India

### ABSTRACT

Postoperative bile leaks are a surgeon's worst nightmare. One of the rare causes is iatrogenic injury to the duct of Luschka (DOL). This anatomical variant is very rare, it is even rarer to detect its presence pre-operatively due to its small size & peculiar location. Therefore, most of the times, it is incidentally detected on table. In such patients, it is carefully safeguarded. Unfortunately, when present, it is also iatrogenically injured often by the unsuspecting surgeon. After iatrogenic injury, there are two scenarios. The first is when the injury is detected on table and subsequently promptly immediately repaired surgically. This avoids postoperative bile leak, formation of bilioma and peritonitis which would then mandate another endoscopic / surgical intervention, in the early postoperative period. The second more dangerous scenario is when the intra-operative iatrogenic injury goes unnoticed. This typically happens due to the fact that it is a very small calibre duct which does not necessarily start leaking bile immediately. Herein, the authors share their experience of encounters with the DOL. The purpose of this case series is to highlight this rare albeit potentially trouble making condition and to add to the literature on this subject. Also, the intention is to drive home the important point that surgeons should carefully and elaborately look for an injury to the DOL. This would increase the chances of intra-operative detection of the same, thereby preventing another surgical intervention, at a later date.

**Key words:** bile leak, bilioma, Duct of Luschka, iatrogenic injury, postoperative

The ducts of Luschka (DOL) are biliary ducts which measure 1-2 mm in diameter. They are intrahepatic biliary ducts that directly drain bile into the gall bladder, in the lower aspect of the right hepatic lobe. It could be either a solitary duct or a network of multiple interconnecting ductules. The point of differentiation between the DOL and a normal intrahepatic bile duct is the fact that it is not accompanied by arteries and veins. Therefore it does not contribute in forming portal triads. It is named after a German anatomist named Hubert von Luschka (1820-1875), who was one of the first people to research it. Its incidence ranges from 12 to 50%, according to a previous study [1]. However, these anomalous ducts are almost never identified prior to a surgical intervention and are associated with dreaded complications such as biliary leakage after laparoscopic cholecystectomy [2].

### CASE SERIES

All the 4 patients of this series had an intra-operative bile leak from the DOL during a laparoscopic cholecystectomy (LC). The presence of the DOL was not known preoperatively, in any of the patients. Three patients were undergoing an elective

LC while the remaining 1 was undergoing an emergency LC. The authors' preferred patient position for LC is supine with the surgeon standing on the patient's left side. In 1 out of the 4 patients, there was a speck of bile noted at the exact time of severance of the DOL. However, in the remaining 3 patients, no such finding was noted. In all these patients, a drop of bile was noted along the posterior mesenteric border of the gall bladder, a little later; while administering local toilet on completion of the surgery. This underscores the importance of careful magnified close up inspection of the probable site of DOL in all patients undergoing LC, prior to de-sufflation.

The authors believe that this simple manoeuvre, if done in all patients will invariably lead to intra-operative detection of iatrogenic DOL injury. In 1 patient, the DOL was clipped using Liga® clips as the available length/stretch made it feasible. In the 3 remaining patients, there was no 'clippable' stretch of the DOL; just a speck of bile noted recurrently from the liver under surface along the posterior mesenteric border. In these 3 patients, the area of iatrogenic injury was under run with a figure of '8' stitch using 3-0 Polydioxanone suture. It is not the authors' standard policy to insert drains after LC.

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**Correspondence to:** Dr. Ravi K Balar, Department of General and Laparoscopic Surgery, Dr. L. H Hiranandani Hospital, Hillside Avenue, Powai, Mumbai, India.  
Email: [ravibalar3895@gmail.com](mailto:ravibalar3895@gmail.com)

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However, in all the 4 patients of the present series, 28 French tube drains were kept in situ in the Morrison's pouch, after being inserted through the lateral 5 mm trocar site. There was no postoperative bile leak in any of the patients and the drains were removed on post operative day (POD) 2, just prior to discharge. On their POD 10 out patients department follow up visit, all the wounds had healed well and all the 4 patients were asymptomatic. The demographic data of this series is summarised (Table 1).

**Table 1 – Patient demographics**

<b>Total no. of patients</b>	4
<b>Average age (range)</b>	52.75 years (26-74 years)
<b>M:F</b>	3:1
<b>Time of Diagnosis (pre, intra or post op)</b>	All incidentally diagnosed intraop.
<b>Surgery being performed at diagnosis</b>	Lap Chole (3 elective & 1 emergency)
<b>Action taken</b>	1 clipping done & 3 underrunning stitches taken
<b>Average follow up period (range)</b>	95 months (45-148 months)
<b>Post op bile leak/bilioma formation</b>	0
<b>Incidence during Lap chole</b>	1.33 % (4 in 3000)

## DISCUSSION

There are two theories explaining the origin of the DOL. The first one considers it a result of a congenital process, occurring secondary to embryological development during the third or fourth week of gestation [3]. The second one considers it as acquired - the DOLs are normal peripheral ducts located in a region where the liver parenchyma has regressed due to liver remodeling, and these channels are branches of the liver parenchyma that become hypertrophic after inflammation [3]. Four types of sub vesical bile (Duct of Luschka) have been described, although there is variability in the literature (Table 2) [2]:

**Table 2 – Types of DOL**

Types	Origin	Drainage
1) Segmental/sectoral subvesical bile duct	Bile duct in segment 5 or 8 that courses near the gallbladder without contacting it	Drain into the right anterior sector duct (RASD) or right posterior sector duct (RPSD)
2) Accessory subvesical bile duct	Additional duct usually arising from segment 5 or 8, coursing superficially along the gallbladder fossa	Drain into the common bile duct (or rarely into the cystic duct)
3) Cholecystohepatic bile duct	Aberrent duct usually arising from segment 5	Drain into the gallbladder
4) Aberrant subvesical bile duct	A mesh of small bile ducts in the liver parenchyma of the gallbladder fossa	Drain into small intrahepatic bile ducts

The Luschka ducts are the most common abnormalities, and their incidence rate varies from 12 to 50% [1]. In most cases, small bile ducts originate from the right hepatic lobe, and they do not open into the gall bladder. This differentiates them from the actual cholecysto-hepatic ducts. Cysto-hepatic ducts drain a part of the right lobe into the cystic duct or the gallbladder. Several studies have shown that the combined incidence rate of cysto-hepatic and cholecysto-hepatic canals varies from 0.2 to 2.3% [1].

The clinical significance of DOL lies in the fact that there almost always lies a risk of injuring them during open or laparoscopic cholecystectomy, which is one of the most frequently performed surgical procedure. In fact, these ducts also have a high risk of injury during liver resection and interventional radiological procedures. Injury to these ducts becomes clinically apparent as biliary leak in postoperative period. This is the second most common cause of the same; injury to the cystic duct being the most common cause [4]. In the classification of iatrogenic injuries of the biliary tree by Strasberg, injury to the DOL is included in type A, as given in the table below. A systematic review by Strasberg et al reported 270 iatrogenic injuries of the biliary tree out of which he classified 62 as type A. Amongst these, 15% (12/270 cases) were DOL leaks. Thus, they were about 4.4% of all of the iatrogenic bile duct injuries and had an incidence of 0.047% among all of the Laparoscopic cholecystectomies performed [5]. Cystic duct stump and aberrant sub vesical bile duct are the most common sites for bile leak following cholecystectomy [5].

It is estimated that approximately 27% of clinically significant bile leaks occur secondary to sub vesical bile duct injury [6]. Though bile leak is the most common complication of an injured DOL, its actual incidence is considered a very rare complication, being reported in only 0.15%-2% of patients undergoing laparoscopic cholecystectomy [6]. Usually, bile leakage from the sub vesical duct tends to be of little importance and in most cases, resolves spontaneously. In a study by Kitami et al, on conducting preoperative evaluation of patients scheduled for a cholecystectomy using a form of computed tomographic cholangiography, sub vesical ducts were found in approximately 10% of patients and all cholecystectomies were performed successfully thereafter with no injury to the duct whatsoever [6].

However, rarely an injured sub vesical duct may result in a persistent bile leak, thus leading to a form of localized or generalized peritonitis with dreadful and potentially life-threatening consequences. The clinical presentation of patients with postoperative bile leak varies from being absolutely asymptomatic to bilioma formation, biliary peritonitis with sepsis, depending on the volume of bile leaked and whether it is sterile or has been infected. However, in general, in majority of the patients the diagnosis is generally obtained during the first week after surgery when they actually present

with symptoms disproportionate to what is expected in a regular postoperative course. These include severe abdominal pain, biliary peritonitis, or even sepsis [7]. Intraoperative detection of the sub vesical bile duct injury and its repair can be achieved with simply suturing the duct, clipping it or using fibrin glue. Clipping is a safe, effective and faster way of managing the bile leak, provided the duct can be clearly delineated.

The clinical presentation of patients with postoperative bile leaks differs from asymptomatic to bilioma formation and biliary peritonitis with sepsis. It depends on the quantity of leaked bile and whether it is infected or not. A majority of the patients report symptoms out of proportion to those expected during a routine postoperative course, usually within the first postoperative week [8]. Common symptoms include abdominal distention, right upper quadrant pain, fever and occasionally jaundice [9].

The preferred diagnostic imaging investigation is an abdominal ultrasound scan to look for presence of a collection. Additional imaging such as Computed tomography, hepatobiliary imino diacetic acid scan (HIDA) may be used to confirm a bile leak. Also, Magnetic resonance cholangiopancreatography (MRCP) can be done as a noninvasive method to also diagnose the source of the leak [10]. Endoscopic retrograde cholangiopancreatography (ERCP) is also useful to determine the source of the leak [10]. It can double up as a therapeutic modality as well since it enables performance of a papillotomy and placement of a stent in the bile duct. This allows internal bile drainage and sealing of the leak. If endo-therapy is not possible, surgical (open / laparoscopic) drainage of the collection with peritoneal toilet and external drainage of bile can be achieved by placement of a T-tube [11].

A review of recently published case reports on DOL is summarized (Table 3).

**Table 3 – Summary of recent published case reports on DOL**

Authors	Journal/Yr. of publication	Type of paper/No. of pts.	Diagnosis – Preop / Intraop / Postop	Action taken
Masoni L. et al [12]	Case report in surgery-2018	Case report/1	Intraop	Closing the duct of Luschka with QuickClip Pro® clips.
Paramythiotis D. et al [13]	Radiology case report-2019	Case report/1	Post op	ERCP with sphincterotomy and placement of biliary stent
Garcia S. et al [14]	Cureus-2022	Case report/1	Post op	Exploratory Laparoscopy with suturing of injured duct of

				luschka
Oulad Amar A. et al [15]	Cureus-2021	Case report/1	Intraop	Percutaneous drainage tube

## CONCLUSION

As seen in this case series, iatrogenic injury to the DOL is a feared, albeit rare complication. Being aware of it and carefully looking for it, is a simple manoeuvre that will increase rate of intra-operative pickup, as seen here. Also, as reported, the authors believe that it is very feasible to repair the iatrogenic trauma laparoscopically, in the same sitting. This series hopes to increase awareness in the future, about this rare condition / anatomical variation and its potential significant adverse implications; so that its early pick up and prompt surgical repair is enabled.

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