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**Review Article**

# Diagnostic approaches to bile leaks from the duct of Luschka

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## ABSTRACT

Bile leaks from the duct of Luschka, also known as subvesical bile ducts, are a rare but clinically significant complications of cholecystectomy, being an etiology of Strasberg type A bile duct injury. Leaks pose a diagnostic challenge due to anatomic variation and non-specificity of presentation. The article provides a detailed examination of diagnostic methods which begin with clinical assessment and continue through laboratory testing and imaging techniques including ultrasound, computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), hepatobiliary iminodiacetic acid (HIDA) scan, endoscopic retrograde cholangiopancreatography (ERCP), intraoperative cholangiography, contrast-enhanced ultrasound (CEUS), and other emerging imaging technologies. The research presents diagnostic accuracy metrics and develops a diagnostic algorithm which enables medical professionals to reach fast. Precise diagnoses while ensuring patient safety.

**Keywords:** Duct of Luschka, Bile leak, Cholecystectomy, Diagnosis

## INTRODUCTION

Luschka's duct, being a subvesical accessory bile duct, plays a part in post-cholecystectomy bile leaks, with most of them being laparoscopic. Strasberg type A lesion is a terminological description of a consequence of leaks from small ducts or cystic duct stumps and is responsible for the majority of iatrogenic bile duct injuries.[1] Their late presentation can result in complications like bilomas, abscesses, even sepsis; therefore, an orderly approach toward a diagnosis is mandatory.[2]

This article puts into perspective evidence about clinical, laboratory, and imaging methods for diagnosing Duct of Luschka bile leaks, with the focus on their anatomical and clinical complexity.

A diagnostic algorithm is also put forward for maximizing patient outcome for the radiologist and surgeon in everyday practice.

## EPIDEMIOLOGY AND INCIDENCE OF LUSCHKA-RELATED BILE LEAKS

The bile leaks in to duct of Luschka during laparoscopic cholecystectomy occur in 0.2–2% cases, relatively higher than bile leaks in open cholecystectomy, in which it ranges from 0–0.5% due to inadequate visualization and feel by the surgeon.[1,3] These bile leaks account for 4-15% of total bile duct injuries, where Strasberg type A leaks far outnumber the others in which bile leaks in to small liver bed ducts or cystic ducts.[4] The risk factors are acute cholecystitis, anatomical variant, and inexperience of the surgeon.[2] The incidences were postulated between 12–50% in duct of Luschka in cadaver studies in difficult cases with abnormal biliary anatomy patients.[4] The bile leaks in type A, including duct of Luschka bile leaks, were revealed to be highest in incidence after cholecystectomy in the literature reviewed, thereby resulting in substantial healthcare expenditure with late onset morbidity.[5] There are variations across the globe with increased incidences

in patients with limited access to intra-operative imaging studies.[6]

## ANATOMY AND VARIANTS OF THE DUCT OF LUSCHKA

The Luschka duct is an accessory small bile duct ranging in number between 1 to 18 mm in the fossa for the gall bladder, with drainage to either the common or right hepatic bile duct.[4] The origin of the duct is attributed to the regression of the bile ductules in the fetus, resulting in variations ranging from single ducts, networked formations, to communications with intrahepatic ducts.[4] Anatomical examinations showed between 30 to 50% possessing subvesical ducts, with 10 to 15% being in complex branching patterns, difficult to visualize during surgery.[7] These variations remain unintligible without the help of modern imaging techniques or during the application of intraoperative cholangiography with risks to injury during the process of dissecting the gall bladder itself (Figure 1).[3] These knowledge on variations remain to be relevant to the surgeon and radiologist on areas to possibly spill over (Figure 2).[2]

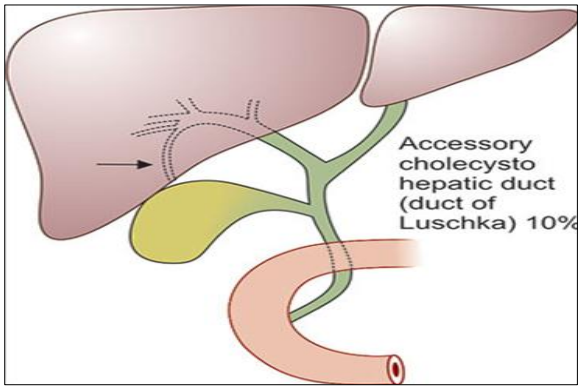


**Figure 1: Duct of Luschka.**

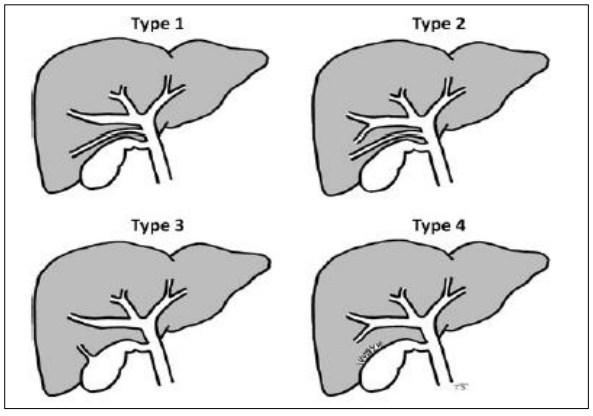


**Figure 2: Types of subvesical bile ducts: type 1—segmental or sectorial subvesical bile duct, type 2—accessory subvesical bile duct, type 3—hepaticocholecystic bile duct, and type 4—aberrant subvesical bile duct.**

## PATHOPHYSIOLOGY OF BILE LEAKAGE

Bilious leakage from the duct of Luschka is a consequence of iatrogenic injury, transection/clipping being most predominant in cholecystectomy.[2] The extravasation of the peritoneum sac/gallbladder fossa with bile leads to inflammation because of iritancy property of bile itself.[6] It leads to localized peritonitis, biloma, or secondary infection such as abscesses.[5] In extreme cases, systemic illness such as sepsis/organ failure can occur in cases with chronic leaks.[3] Following the rationale of pathophysiology, it is primarily dependent on content in bile, i.e., elevated amounts of bilirubin or bile salts, and pressure gradients in propelling bile in the uncommunicative bile ducts.[6] Also affecting the modalities in imaging might be hyperbilirubinemia, making it difficult to detect.[8] Early mechanisms of identification would indeed occur before the onset of morbidity.

## DIAGNOSTIC APPROACHES

### *Clinical presentation*

Patients appear with nonspecific complaints 2–10 days after cholecystectomy with 60–80% patients experiencing right upper quadrant pain, fever, and bilious discharge via surgical drains.[2] Severe illness, including diffuse peritonitis and sepsis, is seen in 5–10% cases, while incidental leaks are discovered via imaging studies in asymptomatic patients.[5] The broad clinical spectrum requires a high level of clinical suspicion, primarily in high-risk patients due to anatomical variant, acute cholecystitis, and other factors.[2] The diagnostic considerations include post-op hematomas, pancreas/duodenal rupture, with careful physical examination being essential in these cases.[6]

### *Laboratory investigations*

Lab studies help with nonspecific diagnoses but are not specific to the condition. The presence of raised serum bilirubin (>2 mg/dl), alkaline phosphatase (>150 U/l), and gamma-glutamyltransferase (>50 U/l) helps in establishing bile leakage/obstruction.[2] The presence of leukocytosis (>12,000/µl) helps in identifying secondary infection as an underlying condition.[5] The study of the drain fluid content can help with diagnostic purposes and confirms if the bilirubin level is more than 10 mg/dl, establishing it to be of biliary origin.[6] On the other hand, it has been seen that in 30% of small bile leaks, values remain within normal ranges of liver function studies, making it less useful.[4]

## RADIOLOGIC METHODS

### *Ultrasound*

Due to ease of access and being non-invasive, it is the primary imaging tool, and it can identify bilomas or fluid

collections with 50–70% sensitivity.[6] Doppler imaging can identify correctly vascular versus bile collections, but it is operator-specific, and it does not give information about which tract the leakage has arisen from.[2] Ultrasound can be useful if you think about not ruling out other differentials, i.e., hematomas, but not in duct of Luschka leaks.[5] Its application is only to aid imaging.[3]

***Computed tomography***

For post-operative fluid accumulation, bilomas, or abscesses, computed tomography (CT) has 70 to 80% sensitivity.[6] For extravasation, implying an ongoing leak, contrast multi-phase studies can help identify it on contrast-enhanced CT but not localize it to the duct of Luschka (Figure 3).[2] The only drawback would be the utilization of radiation, aside from not being able to identify bile from serous fluid or blood (Figure 4).[5]

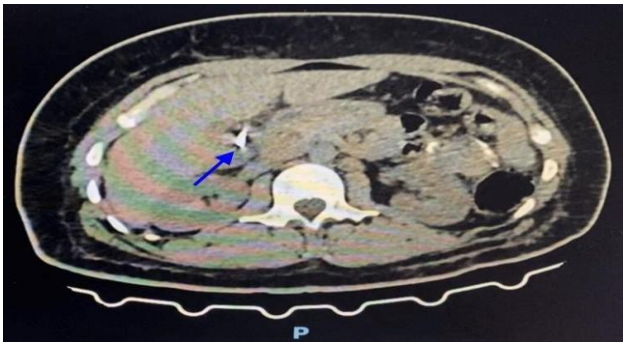

**Figure 3: CT scan of the abdomen shows a small amount of liquid collected on the hepatic bed, extending medially adjacent to the VI hepatic segment (marked by the blue arrow).**

***Magnetic resonance cholangiopancreatography***

Magnetic resonance cholangiopancreatography (MRCP) has good resolution imaging of the bile ducts with high-sensitivity ranging between 81–100% and high-specificity ranging between 83–97% for bile leak detection.[8] For detecting locations of extravasation, T2-weighted images can be applied specifically in communicating ducts, whereas HBC contrast agents such as gadoxetic acid improve the detection of bile leaks.[9] The limitation is low-sensitivity bile leaks in small nondraining bile ducts and in cases of hyperbilirubinemia >5 mg/dl.[8] MRCP is preferred for the evaluation prior to intervention to avoid the invasive method.[2]

***Hepatobiliary iminodiacetic acid scan***

Hepatobiliary iminodiacetic acid scan (HIDA) scan can assist in dynamic assessment of active bile leakage in the injured duct of luschka, with low spatial resolution and thus poorly defined anatomy, frequently necessitating other imaging studies.[10] The question of radiation exposure arises, especially in pediatric patients and pregnant women, although HIDA is useful in cases with poorly defined data due to its non-invasive procedure to substantiate the bile leakage.

**Figure 4: CT scan of the pelvis shows a moderate collection of liquid on the pelvis (marked by the blue arrow).**

***Endoscopic retrograde cholangiopancreatography***

Endoscopic retrograde cholangiopancreatography (ERCP) is considered the gold standard in diagnosing bile leaks because it has a sensitivity and specificity close to 95%.[11] Apart from bile leaks, it can assist in identifying the site of the leakage and perform ERCP-based therapies, which can only be done in Strasberg type-A bile leaks appropriately.[2] The complications mentioned in ERCP complications include pancreatitis, cholangitis, bleeding, and perforation at a ratio of 5 to 10% respectively.

## DIAGNOSTIC ALGORITHM

Diagnostic algorithm is showed in Figure 5.

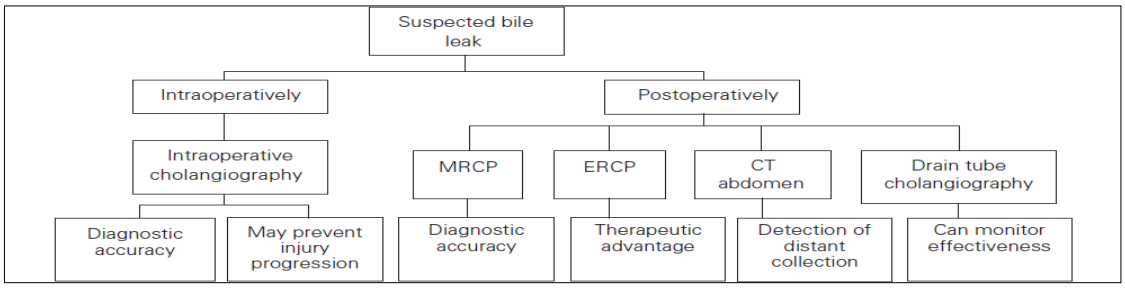


**Figure 5: Investigation options and advantages for suspected bile leak. CT-computed tomography; ERCP-endoscopic retrograde cholangiopancreatography; MRCP-magnetic resonance cholangiopancreatography.**

## CONCLUSION

The bile leaks associated with the duct of Luschka still pose challenges in diagnosis. It can benefit immensely from prompt multimodality evaluation with imaging and ERCP, in terms of management and confirmation of the condition. Sometimes, further imaging studies or surgical evaluation becomes necessary in cases where there is doubt or persistent bile leaks. It is essential to continue to place prime importance on preventive measures to avoid complications.

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## REFERENCES

1. Strasberg SM, Hertl M, Soper NJ. An analysis of the problem of biliary injury during laparoscopic cholecystectomy. J Am Coll Surg. 1995;180(1):101-25.
2. Gawlik C, Carneval M. A review of the management of bile leaks. Cureus. 2021;13(5):e14937.
3. Gupta V, Jayaraman S. Role for laparoscopy in the management of bile duct injuries. Can J Surg. 2017;60(5):300-4.
4. Schnelldorfer T, Sarr MG, Adams DB. What is the Duct of Luschka? A systematic review. J Gastrointest Surg. 2012;16(3):656-62.
5. Halle-Smith JM, Hodson J, Stevens LG, Dasari B, Marudanayagam R, Perera T, et al. A comprehensive evaluation of the long-term clinical and economic impact of minor bile duct injury. Surgery. 2020;167(6):942-9.
6. Zhu Y, Hickey R. The role of the interventional radiologist in bile leak diagnosis and management. Semin Intervent Radiol. 2021;38(3):309-20.
7. Spanos CP, Syrakos T. Bile leaks from the duct of Luschka (subvesical duct): a review. Langenbeck's Arch Surg. 2006;391(5):441-7.
8. Kantarcı M, Pirimoglu B, Karabulut N, Bayraktutan U, Ogul H, Ozturk G, et al. Non-invasive detection of biliary leaks using Gd-EOB-DTPA-enhanced MR cholangiography: comparison with T2-weighted MR cholangiography. Eur Radiol. 2013;23(10):2713-22.
9. Fayad LM, Kowalski T, Mitchell DG. MR cholangiopancreatography: evaluation of common bile duct and pancreatic duct pathologies. Am J Roentgenol. 2003;180(3):675-84.
10. Paramythiotis D, Moysidis M, Rafailidis V, Bangeas P, Karakatsanis A, Kalogera A, et al. Ducts of Luschka as a rare cause of postoperative biloma. MRCP findings. Radiol Case Rep. 2019;14(10):1237-40.
11. Mergener K, Strobel JC, Suhocki P, Jowell PS, Enns RA, Branch MS, et al. The role of ERCP in diagnosis and management of accessory bile duct leaks after cholecystectomy. Gastrointest Endosc. 1999;50(4):527-31.
12. Xu J, Wang J, Liu Y. Contrast-enhanced ultrasound in the detection of biliary leaks: a systematic review. Front Med Technol. 2023;5:946555.
13. Lo Nigro C, Geraci G, Sciuto A, Li Volsi F, Sciume C, Modica G. Bile leaks after videolaparoscopic cholecystectomy: duct of Luschka. Endoscopic treatment in a single centre and brief literature review on current management. Ann Ital Chir. 2012;83(4):303-12.

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