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Laparoscopic Adrenalectomy: New Gold Standard

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Abstract. Nearly 600 cases of laparoscopic adrenalectomy have been described in the world literature, documenting the safety and effectiveness of the procedure. Comparative studies have demonstrated the advantages of the laparoscopic approach when compared to traditional open approaches to adrenalectomy, documenting a more rapid and comfortable recovery, shorter hospitalization, and fewer complications. Several techniques of laparoscopic adrenalectomy have been described. We prefer the transabdominal approach in the lateral decubitus position. Herein we report our experience with 28 adrenalectomies using this approach. Indications for adrenalectomy have been hyperaldosteronism (9), hypercortisolism (4), pheochromocytoma (3), incidentaloma (6), metastasis (3), lymphoma (1), angiomyolipoma (1), other (1). Average tumor size was 3.3 cm (1.4–8.3 cm). Average operative time was 152 minutes (110–210 minutes), with left adrenalectomy taking slightly longer to perform than on the right (156 vs. 145 minutes). There were no intraoperative complications and one conversion to open adrenalectomy for a large metastatic lung cancer found to be invading the liver. One patient experienced left rib pain from a cannula site immediately at the costal margin. There were no other complications. Average length of hospitalization was 2.3 days (1–6 days). With this and others' experience, laparoscopic adrenalectomy has become the gold standard for adrenalectomy. This manuscript reviews the literature on laparoscopic adrenalectomy and describes the transabdominal lateral approach.

Since its initial description in 1992 [1, 2], the use of the laparoscopic approach for adrenalectomy has expanded significantly. Through late 1997 there had been nearly 600 cases of laparoscopic adrenalectomy reported in the world literature, documenting its safety and detailing specific techniques. Importantly, several studies have compared laparoscopic adrenalectomy with open anterior or posterior adrenalectomy, documenting the enhanced recovery, shorter hospital stay, and cost-effectiveness of the laparoscopic approach [3–11]. It appears that laparoscopic adrenalectomy is becoming the gold standard for adrenalectomy.

This success is not surprising considering the similarities between laparoscopic adrenalectomy and laparoscopic cholecystectomy and the overwhelming success of laparoscopic cholecystectomy. Both approaches avoid an upper abdominal incision, both are ablative and therefore do not require any reconstructive techniques that remain problematic (e.g., anastomosis), both procedures benefit from the magnification and clarity of view provided by the laparoscope (anatomically dangerous regions otherwise difficult to widely expose and visualize), and both are most commonly performed for benign disease and involve small, readily extractable specimens. From the standpoint of outcomes, laparoscopic adrenalectomy parallels cholecystectomy in nearly every way.

There remain questions surrounding the application of laparoscopic adrenalectomy: (1) Which technique should be used? (2) When is it contraindicated? (3) Who should perform the procedure?

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Which Laparoscopic Adrenalectomy Technique?

Remembering the unique retroperitoneal location of the adrenal glands, surrounded by fat, bowel and other organs helps to explain the variety of operative approaches for adrenalectomy. Open adrenalectomy has typically been performed through anterior, flank, or posterior approaches. Similarly, there are a variety of techniques and approaches for laparoscopic adrenalectomy (Table 1). Each technique has theoretic advantages relating to adrenal gland exposure and resection. Most advantages relate primarily to establishing the most direct route of access to the adrenals, thereby avoiding excessive dissection and manipulation of surrounding structures. Not all laparoscopic adrenalectomy techniques are transabdominal, but common to all is the use of videoscopic imaging. Therefore it would be most appropriate to refer to the overall technique as videoscopic adrenalectomy (Table 1).

Early data in small series show the feasibility of totally extraperitoneal posterior and flank approaches (Table 1), but there is no clear advantage of these techniques over the more commonly used transabdominal approach. The transabdominal approaches continue to provide the best overall view of the areas of dissection and surrounding structures. Of the transabdominal approaches, the lateral approach offers many advantages over the anterior approach and has been the technique of choice for most surgeons performing videoscopic adrenalectomy.

Transabdominal Lateral Approach

The transabdominal *lateral* approach to adrenalectomy as originally described by Gagner et al. [19], places the patient in lateral decubitus position (Fig. 1B) to allow gravity-facilitated exposure of the adrenals. In this way, tissue and organs overlying the

Table 1. Techniques of videoscopic adrenalectomy and citations in literature.

Technique	References
Videoscopic transabdominal anterior	3, 7, 12–14
Videoscopic transabdominal lateral	4, 6, 8, 15–19
Videoscopic extraperitoneal lateral	3, 20, 21
Videoscopic extraperitoneal posterior	17, 22, 23

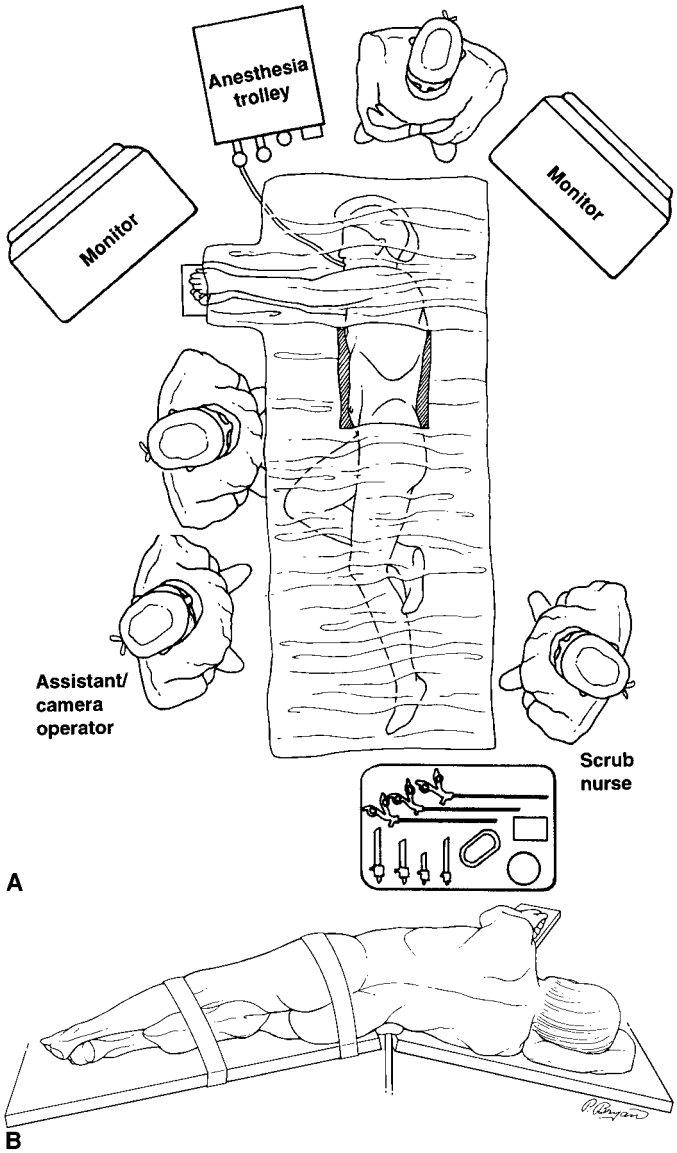

Fig. 1. A. Operating room setup for lateral-approach laparoscopic adrenalectomy. **B.** Patient positioning for lateral-approach adrenalectomy (note kidney rest and table break at iliac crest).

adrenals do not need to be manipulated with laparoscopic instruments, and the complications and bleeding associated with such manipulation are avoided. Following our experience with lateral-approach laparoscopic splenectomy [24], we have used the transabdominal lateral approach for laparoscopic adrenalectomy. This technique is described in detail below.

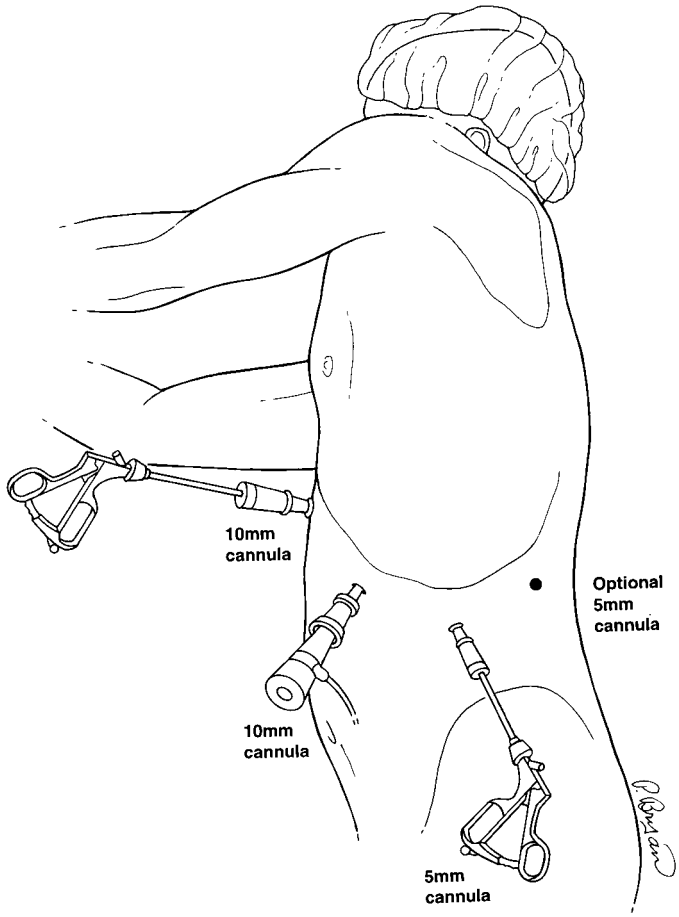

Fig. 2. Cannula sites and uses for lateral-approach laparoscopic left adrenalectomy.

Preoperative Preparation. The night before surgery, patients are limited to a clear liquid diet and take a mild laxative several hours before bed. It decompresses the colon and facilitates upper abdominal visualization and subsequent dissection. Immediately before operation pneumatic compression boots are applied and a preoperative antibiotic (1 g cefazolin) is given. Before transport to the operating room, a beanbag stabilizing bag is placed on the operating table and the operating room is set up as shown in Figure 1A.

Left Adrenalectomy. For left adrenalectomy, after induction of general endotracheal anesthesia, a Foley catheter and an orogastric tube are inserted, and the patient is placed in the lateral decubitus position with the left side up (Fig. 1B). The patient's iliac crest is positioned immediately over the table's kidney rest, the kidney rest is elevated, and the table is extended, which maximizes the distance between the iliac crest and the costal margin in the midaxillary line for subsequent cannula insertion. Using a beanbag on the operating table facilitates stabilization of the patient in this position. The left arm is positioned over the chest on a sling. All pressure points are adequately padded.

The patient is prepared and draped so that either laparoscopy or open surgery can be performed. Cannula sites and uses are shown in Figure 2. Preincisional local anesthesia is used along

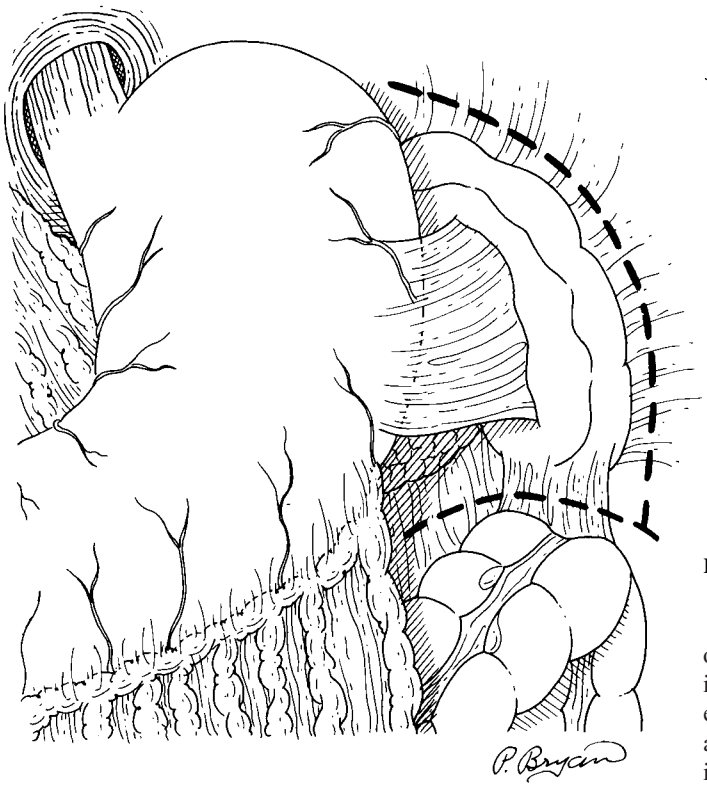

Fig. 3. Initial lines of dissection along splenorenal and splenocolic ligaments.

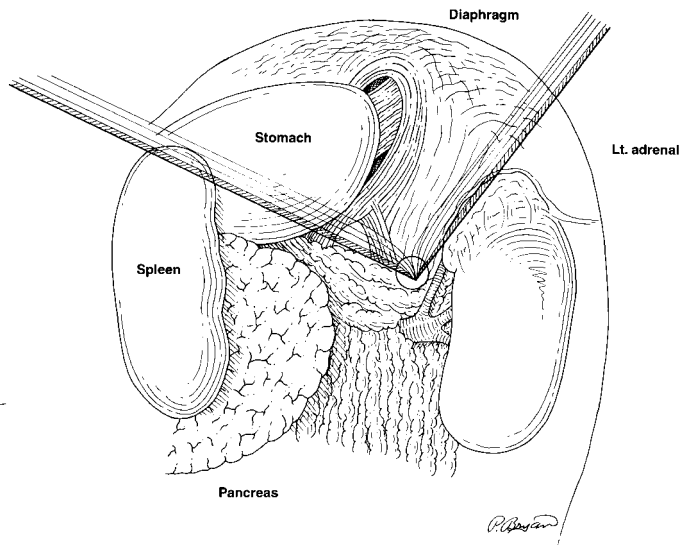

Fig. 4. "Opening the book."

with moderate reverse Trendelenburg positioning. Carbon dioxide pneumoperitoneum to 15 mmHg is initiated with a Veress needle inserted at the midclavicular line below the left costal margin (cannula site for the camera). After establishing pneumoperitoneum, the remaining cannula sites are marked. A fourth cannula in the posterior axillary line is optional. (It has been avoided in nearly 50% of our patients.) A 30-degree angle laparoscope is used.

The first step of the operation is to establish the plane along the anterior surface of the left kidney just lateral and dorsal to the spleen and tail of the pancreas. This is accomplished by incising the splenorenal ligament and mobilizing the spleen laterally (Fig. 3). The decubitus positioning facilitates this dissection and mobilization. With gravity pulling the spleen medially and away from the anterior surface of the kidney, the spleen and tail of the pancreas are dissected away from the retroperitoneum; the superior pole of the kidney and the adrenal are thus exposed. This dissection plane is relatively avascular. If excessive bleeding is encountered, the wrong plane of dissection is being developed. It is important to continue this mobilization up to the diaphragm and close to the greater curve of the stomach and short gastric vessels. The dissection along the anterior surface of the kidney and adrenal continues until the inferior pole and medial border of the adrenal are exposed. In this way, the exposure is analogous to opening a book, with the pages of the book being the spleen/pancreatic tail and the anterior surface of the kidney/adrenal, and the spine of the book being a line just beyond the medial edge of the adrenal gland (Fig. 4). Depending on the adrenal pathology and amount of retroperitoneal fat, the lateral and anterior surface of the adrenal gland becomes visible during this dissection. It is important to avoid mobilizing the adrenal gland along its lateral edge too early during the exposure. If this mistake is made, gravity allows the mobilized adrenal to fall medially and prevents visualization and access to the medial and inferior edges of the gland, where the left adrenal vein is most likely encountered.

When the retroperitoneal fat prevents clear visualization of the gland, its medial and inferior edge can be localized by palpation, as the adrenal is ballotable in the retroperitoneal tissue along the anterior surface of the kidney. In even the most obese patients or those with Cushing's disease, this technique has allowed identification of the dissection plane between the anterior surface of the kidney and the inferior border of the adrenal. Once this cleavage plane is identified, careful dissection with hook cautery eventually exposes the inferior and medial edge of the gland. In these difficult situations, some have advocated the routine use of intraoperative laparoscopic ultrasonography to locate the gland. Although we always have ultrasonography available, using the techniques described above we have never needed to rely on it for gland localization. We have performed laparoscopic left adrenalectomy in several patients weighing over 300 pounds and in those with Cushing's disease—situations where localization can be problematic—and experienced no difficulty in adrenal localization.

The next step is isolation of the left adrenal vein. With small tumors (< 5 cm) it is most easily accomplished by first dissecting the inferior and medial aspect of the adrenal, staying close to the gland until the vein is isolated and clipped (Fig. 5). A right-angle dissector greatly facilitates this exposure and isolation. Risk of injuring the left renal vein is minimized by staying close to the adrenal gland during this dissection. The adrenal vein is then clipped with a medium-large ligaclip. We have found a 5-mm clip applier adequate for this ligation. Once the vein is transected, dissection continues from inferior and medial to superior and lateral following the anterior surface of the kidney. For large tumors, early identification of the adrenal vein may be difficult. In these cases, we mobilize the gland laterally and inferiorly to find the inferior border of the gland and the adrenal vein.

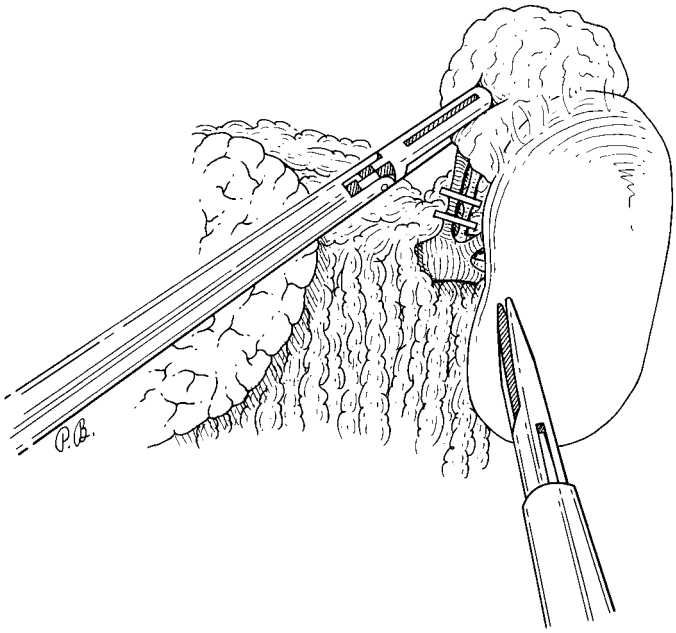

Fig. 5. Isolation and control of the left adrenal vein.

Final dissection and gland excision progresses from medial to lateral and inferior to superior. Some have advocated use of an ultrasonic dissector to dissect the soft tissues surrounding the adrenal, but we have found monopolar electrocautery with a hook dissector to be the most effective method in the confined space and the relatively avascular planes of dissection. The inferior phrenic artery is frequently encountered along the superior edge of the adrenal and should be sought and ligated with ligaclips.

Before specimen extraction, the operative field is carefully inspected for hemostasis. The area is irrigated and suctioned dry. Points of bleeding from retroperitoneal fat are point-coagulated with electrocautery. Areas of bleeding from visible vessels are clipped. Once hemostasis is ensured, the adrenal is placed in a specimen retrieval sac that has been inserted through the medial 10-mm cannula (Fig. 6). Bag size depends on the specimen to be removed. Regardless, the bag must be stout enough so as not to rupture during extraction. The fascia of the cannula site of extraction may need to be stretched with a Kelly clamp to facilitate removal. For large tumors, the entire incision may need to be extended. The adrenal should not be morcellated, as the histologic architecture must be preserved for pathologic analysis.

The operation is completed by closing the fascia of the 10-mm incisions with absorbable suture. If a significant amount of irrigation fluid was used during the procedure, it tends to disperse to the lower and right abdomen, out of the reach of suction. Aspiration of this irrigant may be difficult, and when the patient is again supine the irrigant tends to drain from the lateral cannula site. In such a circumstance, a soft Silastic drainage catheter positioned in the left upper quadrant and exiting the lateralmost cannula site may help control and evacuate this fluid during the first 12 hours postoperatively. This drain is removed on the first postoperative morning. When irrigation is minimal (< 500 ml) no drain is necessary.

Right Adrenalectomy. For right adrenalectomy the patient is placed in the lateral decubitus position with the right side up. The remainder of patient positioning is identical to that described for left adrenalectomy. Pneumoperitoneum to 15 mmHg is initiated with a Veress needle inserted at the midclavicular line below the right costal margin (cannula site for the camera). After establishing pneumoperitoneum, the remaining cannula sites are marked (Fig. 7). A fourth cannula in the epigastrium is necessary for a retractor to elevate the right lobe of the liver. This cannula site should be several centimeters below the costal margin, allowing the angle of retractor insertion to be parallel to the undersurface of the right lobe of the liver. Too cephalad an insertion creates an acute angle to the undersurface of the liver, making positioning of the liver retractor difficult. We use a 5-mm liver retractor, allowing trocar sites to remain as small as possible. The liver retractor can

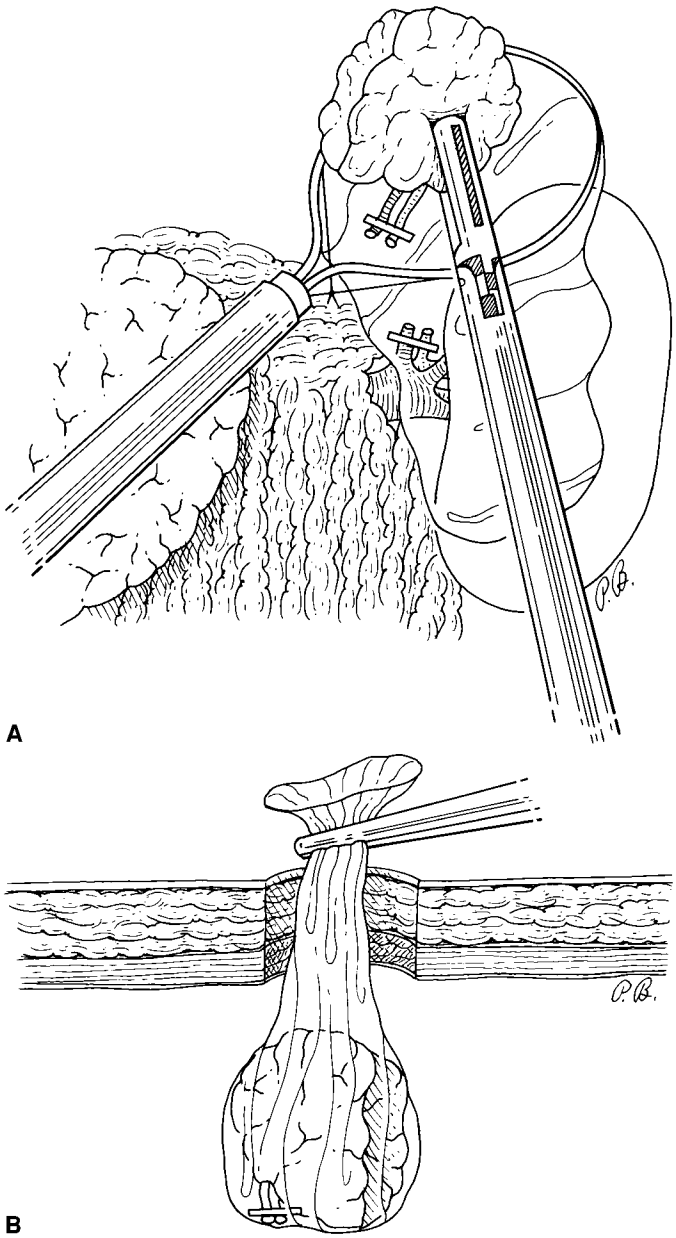

Fig. 6. Excised adrenal gland is placed in a specimen retrieval sac **(A)** and removed **(B)**.

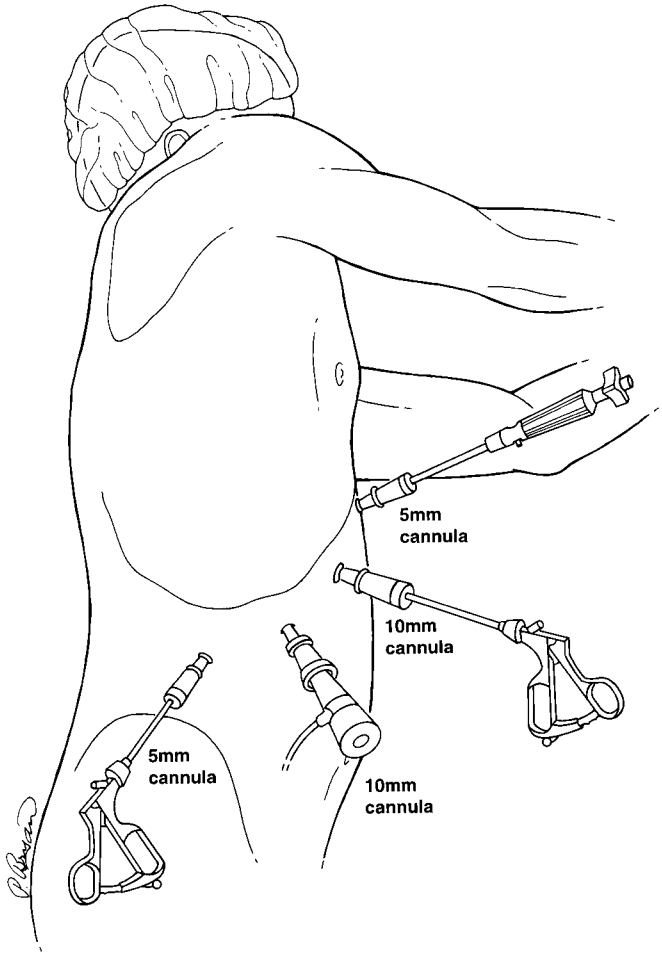

Fig. 7. Cannula sites and uses for lateral-approach laparoscopic right adrenalectomy.

be held by the first assistant/camera operator. We use a table-mounted liver retractor, allowing the first assistant to stand at the surgeon's left side.

With the liver retractor positioned, the anterior surface of the right kidney and the lateral edge of the inferior vena cava can be seen clearly. The dissection commences by creating a hockey-stick-shaped incision along the retroperitoneal attachment of the right lobe of the liver and the medial border of the inferior vena cava (Fig. 8). This mobilizes the right lobe of the liver posteriorly and allows exposure of the anterior surface of the adrenal as the liver is pushed cephalad. Except with exceptionally large or high-riding tumors, the triangular ligament of the liver does not need to be incised. The medial border of the inferior cava is carefully exposed, looking for the right adrenal vein, remembering that this vein is typically broad and short and enters the cava slightly posteriorly. We have found using a blunt-tipped right-angle dissector most useful for this dissection (Fig. 9). Once the adrenal vein has been isolated, it is ligated (Fig. 10) with three medium-large ligaclips proximally and two distally. Because of the short length of this vein, the proximal most clip should be immediately at the edge of the cava.

Once the right adrenal vein has been controlled and divided, dissection continues to expose and mobilize the medial edge of the adrenal. As with the left adrenal, the lateral edge should not be dissected too early because gravity causes the laterally mobilized gland to hang over the medial edge, making visualization difficult. By dissecting from medial to lateral and inferior to superior, the superior pole of the kidney can be used as a dissection plane and the dissection progresses in a direction away from any anatomic concerns (inferior vena cava and renal vein). As with the left adrenal, monopolar electrocautery is adequate for most of the dissection. Visible vessels are clipped, and the inferior phrenic vessels are commonly encountered at the superior and lateral border of the gland. Once excised, the adrenal is placed in a specimen retrieval sac and removed intact through the medial-most 10-mm cannula site.

Bilateral Adrenalectomy. Bilateral adrenalectomies are performed in the manner already described for each individual side. Because right adrenalectomy has a higher risk of conversion to open adrenalectomy due to the immediate consequences of an adrenal vein/caval injury, we perform left adrenalectomy first. In this way, the patient has the greatest likelihood of benefiting from a laparoscopic approach. Before repositioning for right adrenalectomy the entire left adrenalectomy is completed, including wound closure and abdominal desufflation (minimizing the duration of CO_2 pneumoperitoneum). The operating time for bilateral adrenalectomies has averaged 305 minutes including turnover time between sides.

Postoperative Care. The orogastric tube and Foley catheter are removed before the patient awakens. Postoperatively, the patient is given clear liquids and ambulates the night of surgery. Pain is controlled with intermittent parenteral narcotics until the patient is able to take oral pain medication. Diet is advanced on postoperative day 1, and the patient is discharged when tolerating oral intake and pain is controlled with oral analgesics.

Who Should Undergo Laparoscopic Adrenalectomy?

Several authors have documented the safety of laparoscopic adrenalectomy for most adrenal pathology [25–31]. We have found few absolute contraindications to laparoscopic adrenalectomy. Clearly, the patient with known invasive adrenal carcinoma should undergo a more formal, open cancer operation allowing en bloc excision of the adrenal cancer and surrounding associated tissue and organs. Because nonfunctioning tumors larger than 6 cm have a higher risk of malignancy, many have suggested that tumor size larger than 6 cm is a contraindication to the laparoscopic approach. We view size as a relative contraindication when tumors are larger than 10 cm, primarily because of the difficulty tumors this large create in terms of exposure and mobilization, not because of the cancer risk. With any size tumor, if tissue planes suggestive of cancer are encountered, biopsies are obtained. If malignancy is found the operation is converted to an open cancer operation. Other absolute contraindications are those of any laparoscopic operation (uncorrectable coagulopathy, prior abdominal surgery preventing safe laparoscopic access or exposure, and cardiopulmonary disease preventing general anesthesia or pneumoperitoneum).

Debate continues regarding the management of patients with adrenal incidentalomas. Traditionally, nonfunctioning adrenal tumors discovered during abdominal computed tomography (CT)

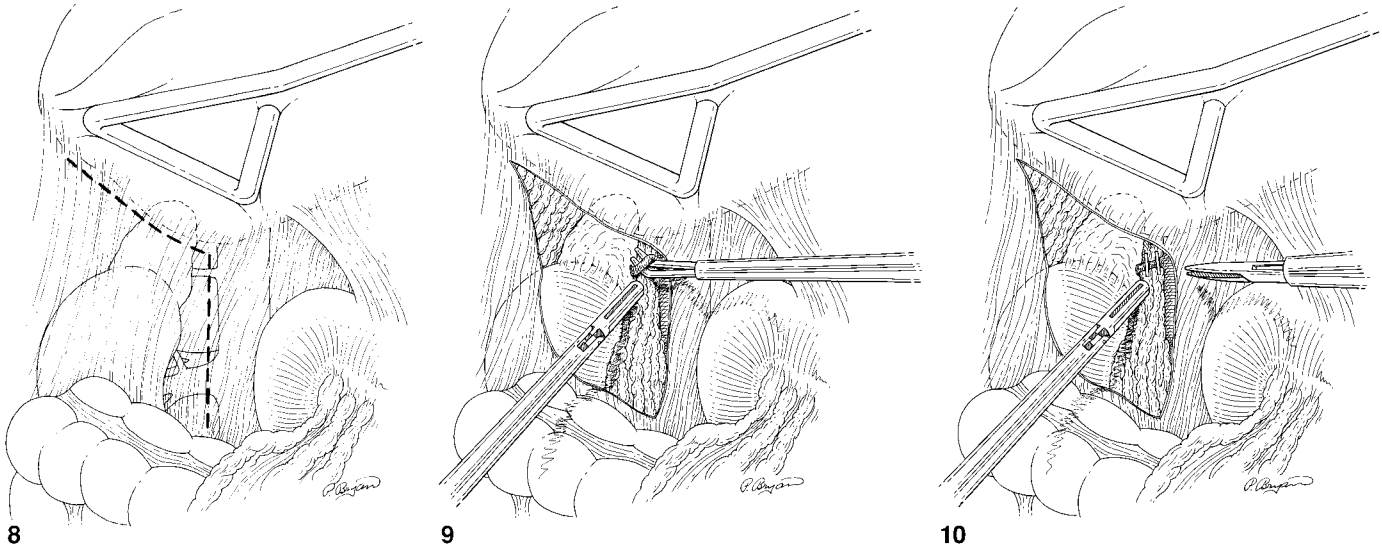

Fig. 8. Hockey-stick incision for initial dissection of right adrenal gland.

Fig. 9. Exposure and isolation of the vena cava and right adrenal vein using a blunt-tipped right-angle dissector.

Fig. 10. Ligation of the right adrenal vein with ligaclips.

or ultrasonography for other indications have been managed based on tumor size, with tumors > 6 cm being removed and those < 3 cm considered inconsequential and requiring no further management. Incidentalomas of 3 to 6 cm are typically observed with serial CT scans and removed if they increase in size. With the success of laparoscopic adrenalectomy and the dramatically improved patient recovery, we are beginning to see more referring physicians requesting adrenalectomy for the 3- to 6-cm incidentaloma. It has been suggested that this management strategy may be more cost-effective, thereby avoiding multiple CT evaluations or the potential of patients being lost to follow-up and presenting with advanced lesions later in their course. Although this protocol may be appropriate in select patients, more data are necessary before recommending adrenalectomy for all nonfunctioning tumors of 3 to 6 cm.

Table 2. Laparoscopic adrenalectomy at University of Cincinnati/Emory University.

Parameter	No.
Total no.	28
Left/right	14:14
Indications	
Hyperaldosteronism	9
Hypercortisolism	4
Pheochromocytoma	3
Incidentaloma	6
Metastasis	3
Lymphoma	1
Angiomyolipoma	1
Other	1

Table 3. Laparoscopic adrenalectomy at University of Cincinnati/Emory University: outcomes.

Parameter	Result
Tumor size (cm)	3.3 (1.4–12.2)
Operative time (minutes)	152 (110–210)
Left	156
Right	145
Converted	1[a]
Blood loss (cc)	62 (20–250[a])
Intraoperative complications	0
Length of stay (days)	2.3 (1–6)
Postoperative complications	1

[a]Metastatic lung cancer invading liver (greatest blood loss).

Outcomes

Using the techniques described above, we have performed 28 laparoscopic adrenalectomies for a variety of adrenal pathology (Table 2). Outcomes from this small series are listed in Table 3. The one conversion to an open adrenalectomy was in a patient with lung cancer and a metastasis to the right adrenal that was found to be invading the right lobe of the liver. This patient experienced the greatest intraoperative blood loss in this series. Several authors have similarly detailed their experience with laparoscopic adrenalectomy. Series with 20 or more laparoscopic adrenalectomies are summarized in Table 4. With similar results from nearly 600 laparoscopic adrenalectomies reported in the world's literature, the feasibility and safety of this technique is proven.

Reports comparing laparoscopic adrenalectomy to open adrenalectomy generally find the best outcomes associated with laparoscopic adrenalectomy. Jacobs and colleagues [6] retrospectively compared patients undergoing open anterior adrenalectomy with those undergoing laparoscopic adrenalectomy. Perioperative blood loss, complications, and length of hospital stay were significantly decreased in the laparoscopic group. Operating time and overall patient charges were not significantly different between the

Table 4. Summary of outcomes of selected experiences with laparoscopic adrenalectomy.

Study	No.	OR time (min)	Converted (%)	Complications		Length of stay (days)
				No.	%	
Vargas [11], 1997	20	155	2	2	10	3.2
Brunt [4], 1996	24	183	0	–		3.2
Duh [17], 1996	23	226	0	1 death	4	2.2
Gagner [32], 1996	85	130	2	13	15	3.0
Marescaux [16], 1996	26	200	5	3	12	4.6
Miccoli [33], 1995	25	109	0	0		3.0
Nakagawa [34], 1995	25	254	0	0		
Present study	28	151	1	1	4	2.2
Total	256	176	10 (4)	20	8	2.7

groups. These authors concluded that laparoscopic adrenalectomy is the preferred surgical technique for benign adrenal disease.

Some surgeons have suggested that the laparoscopic approach offers no advantages over the open posterior technique. Brunt and colleagues [4] retrospectively compared patients undergoing open anterior, open posterior, and laparoscopic adrenalectomy. Patients undergoing laparoscopic adrenalectomy experienced significantly less intraoperative blood loss, less postoperative parenteral narcotic use, shorter hospital stay, and fewer overall complications when compared to either the open anterior or posterior technique. Although the operating time for a laparoscopic adrenalectomy was significantly longer, the overall hospital charges were not significantly different. This group of investigators, who have extensive experience with posterior adrenalectomy, concluded that laparoscopic adrenalectomy is the preferred operative approach for patients with small, benign adrenal neoplasms. When combined with the many case series detailing the technique's safety, the weight of evidence clearly establishes laparoscopic adrenalectomy as the new gold standard for adrenalectomy. As with cholecystectomy, this overwhelming success will make prospective randomized comparisons of laparoscopic adrenalectomy to open techniques difficult to complete as patient and physician demand limit willingness to undergo open adrenalectomy.

Who Should Perform Laparoscopic Adrenalectomy?

Finally, who should perform laparoscopic adrenalectomy? With the technique well described, the greatest challenge when managing patients with adrenal abnormalities remains the cost-effective and correct identification of those who should undergo adrenalectomy. Ongoing, in-depth knowledge of the pathophysiology and evaluation of the various adrenal abnormalities is critical to select patients properly for adrenalectomy and to plan their operative therapy. The most rational application of laparoscopic adrenalectomy will remain with those surgeons experienced in the overall management of adrenal diseases and extensive experience in open adrenal surgery [35, 36].

Conclusions

Laparoscopic adrenalectomy has become the gold standard for adrenalectomy. When performed by appropriately trained and skilled surgeons, the laparoscopic approach is superior to open adrenalectomy.

Résumé

Presque 600 cas de surrénalectomie laparoscopique ont été rapportés dans la littérature mondiale, gage de la sûreté et de son efficacité. Des études comparatives ont démontré les avantages de l'approche laparoscopique par rapport à la surrénalectomie par voie traditionnelle, ouverte, car elle est plus rapide, améliore le confort postopératoire, procure une hospitalisation plus courte et est associée à moins de complications. Plusieurs techniques de surrénealectomie laparoscopique ont été décrites. Nous préférons l'approche transabdominale, le patient placé en décubitus latéral. Nous rapportons ici notre expérience par cette approche avec 28 patients. Les indications de cette approche ont été comme suit : l'hyperaldostéronisme (n = 9), l'hypercortisolisme (n = 4), le phéochromocytome (n = 3), l'incidentalome (n = 6), les métastases (n = 3), le lymphome (n = 1), l'angiomyolipome (n = 1) et d'autres (n = 1). La taille moyenne de la tumeur a été de 3.3 cm (1.4–8.3 cm). La durée opératoire moyenne a été de 152 minutes (110–210 minutes), la surrénalectomie gauche prenant un peu plus de temps que la droite (156 minutes comparés à 145 minutes). Il n'y avait aucune complication peropératoire et une conversion a été nécessaire dans un seul cas, pour une métastase d'un cancer pulmonaire envahissant le foie. Un patient a eu des douleurs costales gauches en rapport avec un orifice de trocart juste sous le rebord costal. On n'a observé aucune autre complication. La durée moyenne d'hospitalisation a été de 2.3 jours (1–6 jours). Se basant sur notre expérience et celle des autres, la surrénalectomie laparoscopique est devenue le gold standard pour cette opération. On résume ici la littérature de la surrénalectomie par laparoscopie en décrivant l'approche transabdominale latérale.

Resumen

Cerca de 600 casos de adrenalectomía laparoscópica han sido descritos en la literatura mundial, lo cual documenta su seguridad y efectividad. Estudios comparativos han demostrado las ventajas del abordaje laparoscópico en comparación con los abordajes abiertos tradicionales, evidenciando una recuperación más rápida y confortable, una hospitalización más breve y menos complicaciones. Se han descrito diversas técnicas de adrenalectomía laparoscópica; nuestro grupo prefiere el acceso transabdominal en la posición de decúbito lateral. En este artículo informamos nuestra experiencia con 28 casos por este abordaje. Las indica-

ciones para adrenalectomía fueron: hiperaldosteronismo (9), hipercorticolismo (4), feocromocitoma (3), incidentaloma (6), metástasis (3), linfoma (1), angiomiolipoma (1) y otras (1). El tamaño promedio del tumor fue 3.3 cm (1,4–8,3 cm), el tiempo operatorio promedio 152 minutos (110–210 minutos), con la adrenalectomía izquierda tomando un poco más d tiempo que la derecha (154 vs. 145 minutos). No se presentaron complicaciones intraoperatorias, y en un caso que requirió conversión a adrenalectomía abierta por un gran cáncer metastásico del pulmón, se encontró invasión del hígado. Un paciente experimentó dolor costal izquierdo causado por la ubicación de uno de los sitios de acceso de una cánula, en la cercanía inmediata del reborde costal. No se registraron otras complicaciones. El promedio del tiempo de hospitalización fue 2,3 días (1–6 días). Con esta experiencia y la de otros, la adrenalectomía laparoscópica ha venido a convertirse en el patrón oro para la adrenalectomía. En este manuscrito se revisa la literatura sobre adrenalectomía laparoscópica y se describe el abordaje transabdominal lateral.

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