# Laparoscopic Adrenalectomy as a Management for Benign Suprarenal Tumors

"Essay"

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# CONTENTS

**List of Abbreviations …… i**

**List of Tables ……. ii**

**List of Figures …… iii**

**1. Introduction …… 1**

**2. Aim of the work ……. 3**

**3. Review of the literature**

1. Surgical anatomy of adrenal glands**……... 4**

2. Physiology of adrenal glands**…… 12**

3. Surgical aspects of benign adrenal tumors…… **17**

4. Laparoscopic approaches to the adrenal gland**……..… 45**

**4. Summary and conclusion …… 75**

**5. References ……..…… 78**

**6. Arabic summary**

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# List of Abbreviations

| | |
|---|---|
| **2D** | two-dimensional image |
| **3D** | three-dimensional image |
| **AACE** | American Association of Clinical Endocrinologists |
| **AAES** | American Association of Endocrine Surgeons |
| **AAL** | anterior axillary line |
| **ACC** | adrenocortical carcinoma |
| **ACE** | Angiotensin-converting enzyme |
| **ACTH** | adrenocorticotropic hormone |
| **AI** | adrenal incidentaloma |
| **ARR** | aldosterone-to-renin ratio |
| **ATA** | Anterior transabdominal adrenalectomy |
| **AVS** | adrenal venous sampling |
| **BMI** | body mass index |
| **BP** | blood pressure |
| **CAH** | Congenital adrenal hyperplasia |
| **CMV** | Cytomegalovirus |
| **CNS** | central nervous system |
| **COP** | cardiac output |
| **CRH** | corticotrophin-releasing hormone |
| **CT** | Computed tomography |
| **DHEA** | dehydroepiandrosterone |
| **DHEAS** | dehydroepiandrosterone sulphate |
| **DHT** | dihydrotestosterone |
| **DM** | diabetes mellitus |
| **DOPA** | dihydroxyphenylalanine |
| **DST** | dexamethasone suppression test |
| **DVT** | deep vein thrombosis |
| **EBL** | Estimated blood loss |
| **ECF** | extracellular fluid |
| **ER** | endoplasmic reticulum |
| **FDG** | fluorodeoxyglucose |

| | |
|---|---|
| **FNA** | fine needle aspiration |
| **GR** | glucocorticoid receptors |
| **HED** | hydroxyephedrine |
| **HR** | heart rate |
| **HU** | Hounsfield units |
| **IGF** | insulin-like growth factor |
| **IMA** | inferior mesenteric artery |
| **IV** | intravenous |
| **IVC** | inferior vena cava |
| **JGA** | juxtaglomerular apparatus |
| **LA** | laparoscopic adrenalectomy |
| **Lf** | left |
| **LTA** | Lateral transabdominal adrenalectomy |
| **LTPA** | laparoscopic transperitoneal adrenalectomy |
| **MAL** | mid axillary line |
| **MAX gene** | MYC-associated factor X gene |
| **MEN** | Multiple endocrine neoplasia |
| **MIBG** | metaiodobenzylguanidine |
| **MRI** | Magnetic resonance imaging |
| **NF** | Neurofibromatosis |
| **NOTES** | natural orifice transluminal endoscopic surgery |
| **NP59** | 131 Iodine -6-- iodomethyl- 19-norcholesterol |
| **OA** | open adrenalectomy |
| **P53** | protein 53 suppressor gene |
| **PA** | Primary Aldosteronism |
| **PET** | Positron emission tomography |
| **PRA** | laparoscopic posterior retroperitoneal adrenalectomy |
| **PVR** | peripheral vascular resistance |
| **RAS** | renin-angiotensin system |
| **RBF** | renal blood flow |
| **RT** | right |
| **SARA** | Single Access Retroperitoneal Adrenalectomy |
| **SCS** | subclinical Cushing syndrome |

| | |
|---|---|
| **SDH** | Succinated Dehydrogenase |
| **SUV max** | maximum standardized uptake value |
| **TPN** | total parenteral nutrition |
| **UFC** | urine free cortisol |
| **US** | Ultrasound |
| **UTI** | urinary tract infection |
| **VHL** | Von Hippel–Lindau disease |
| **VMA** | vanillylmandelic acid |
| **WS** | Wandering Spleen |

# List of Tables


| Number | Table | Page |
|---|---|---|
| **1** | Action of glucocorticoids. | **14** |
| **2** | Clinical presentation of Cushing's syndrome. | **20** |
| **3** | Genetic syndromes associated with development of pheochromocytomas. | **24** |
| **4** | Differential diagnosis of the adrenal incidentaloma. | **36** |
| **5** | Imaging characterization of benign and malignant adrenal masses. | **40** |
| **6** | Situations that are amenable to the transperitoneal and retroperitoneal approaches. | **63** |
| **7** | Main complications of laparoscopic adrenalectomy. | **71** |

# List of Figures


| Number | Figure | Page |
|---|---|---|
| 1 | Development of adrenal glands. | 6 |
| 2 | Blood supply of adrenal glands. | 9 |
| 3 | The lymphatic drainage of adrenal glands. | 10 |
| 4 | Histological layers of adrenal glands. | 11 |
| 5 | Algorithm for diagnosis and management of primary aldosteronism. | 18 |
| 6 | Diagnostic Algorithm of Cushing's syndrome. | 21 |
| 7 | Non-enhanced CT abdomen revealing a large, well-defined heterogeneous pheochromocytoma with attenuation of 35 HU (red arrow). | 27 |
| 8 | T2-weighted MRI shows that the right adrenal tumor has high signal intensity (light bulb sign). | 28 |
| 9 | 123I-MIBG scan (front and back views) showing large left adrenal pheochromocytoma with physiological occupancy at thyroid, liver and bladder. | 28 |
| 10 | 18F-FDG PET scan showing right adrenal pheochromocytoma. | 29 |
| 11 | An adrenal mass (arrow) is identified on CT (panel A) with characteristics of an adenoma with a non-contrast CT density (panel B) of 9.8 HU. | 39 |
| 12 | Left adrenal carcinoma. Contrast enhanced CT demonstrating the large heterogeneous mass with central calcification (arrows). | 40 |

| | | |
|---|---|---|
| **13** | AACE guidelines for management of Adrenal Incidentaloma. | **42** |
| **14** | CT scan showing a myelipomatous lesion. | **43** |
| **15** | Port site placement for laparoscopic (A) left adrenalectomy, and (B) right adrenalectomy. | **51** |
| **16** | Exposure of the left adrenal gland with vein isolated. | **53** |
| **17** | Trocar placement, exposure and division of the right adrenal vein for right adrenalectomy. | **55** |
| **18** | Patient position with port site placement for lateral retroperitoneal right adrenalectomy and important anatomical landmark. | **56** |
| **19** | Left-side retroperitoneoscopic view (Abbreviations: A: adrenal. AV: adrenal vein. LV: lumbar vein. RA: renal artery. RV: renal vein). | **58** |
| **20** | Right-side retroperitoneoscopic view (Abbreviations: AV: adrenal vein. IVC: inferior vena cava. P: psoas muscle). | **59** |
| **21** | Prone patient position for posterior retroperitoneal approach. | **61** |
| **22** | Single port with three working channel and articulated instrument for single access laparoscopic surgery. | **65** |
| **23** | Robot-assisted adrenalectomy: port placement, patient position and room set-up. | **68** |

# K-words

**Adrenal Glands, Incidentaloma, Cushing Syndrome, Aldosternoma, Pheochromocytomas, Laparoscopic, Minimal Invasive, Adrenalectomy, Transperitoneal, Retroperitoneal.**

# Abstract

Since the introduction of laparoscopic adrenalectomy by Gagner et al. in 1992, the majority of benign adrenal lesions have been removed by various laparoscopic techniques. The modalities of choice in the evaluation of an adrenal mass are computed tomography (CT) scanning, magnetic resonance imaging (MRI), and positron emission tomography (PET) scanning. Advantages of laparoscopic surgery include low risk of bleeding, smaller incision size, low risk of pain and bleeding after surgery, short hospital stay and low morbidity and mortality. Lateral transabdominal approach **(LTA)** seems to be the technique of choice for most surgeons. A robotic radical adrenalectomy results in significantly less blood loss during surgery, reducing the need for blood transfusions, and less post-operative pain and scarring.

# Introduction and Aim of the work

# INTRODUCTION

The adrenal glands lie retroperitoneally on each side of the vertebral column at the level of 11th - 12th thoracic vertebrae. They are in close contact with the superior poles of the kidneys and surrounded by peri-renal fat and Gerota's fascia. The normal adrenal gland weighs about 6 g and is 5 cm long, 2.5 cm wide and 1 cm thick. ***(Williams, P. L, 1989)***

Adrenal cortex produces three sorts of steroid hormones from plasma cholesterol: mineralocorticoids, glucocorticoids and sex steroids. ***(Dunn R. B. et al., 2011)***

Adrenal medulla synthesizes catecholamines under control of central nervous system (CNS) which is affected differently by physiological stimuli e.g.: stress. ***(Nelson, L.et al., 2004)***

The differential diagnosis of adrenal masses includes many entities such as adenoma, aldosteronoma, Cushing's syndrome, virilizing tumor, pheochromocytoma, adrenocortical carcinoma, metastatic disease, myelolipoma, ganglioneuroma, adrenal cyst, and hematoma. ***(Cook DM, 1997).***

Adrenal masses are often discovered incidentally and are then termed adrenal incidentalomas (AIs). They are often discovered after an imaging procedure is performed that is unrelated to the adrenal gland. Incidence has been increasing proportionally to the use of radiographic imaging. Less commonly, AIs are discovered as part of the clinical workup for suspected adrenal disease (eg, Cushing syndrome). ***(Terzolo M et al., 2009)***

Approximately 80% of AIs are nonfunctional and benign. The other 20% of AIs are either functional or malignant and require further evaluation and treatment to avoid medical complications. ***(Cawood TJ et al., 2009)***

Diagnosis of adrenal incidentaloma (AI) is fulfilled by evaluation of patients clinically, biochemically, and radiographically for presence of hormonal active tumors (Cushing's syndrome, aldosteronism, pheochromocytomas) and presence or history of malignant tumor. ***(Zeiger MA et al, .2009)***

The treatment for a hormonally active adrenal tumor is surgery. Nonfunctional adrenal cortical adenomas are usually not premalignant, and surgical excision is not indicated if < 4cm and should be radiographically followed up. If nonfunctional adenoma is > 4cm, adrenalectomy is recommended. ***(Yener S et al., 2010)***

Since its first description in 1992 by Gagner, the laparoscopic adrenalectomy has become a new gold standard in adrenal surgery for small benign tumors. This method seems to have the general advantages of minimally invasive surgery, the complication rate is low and conversion is seldom necessary. The advantage of the LA lies in the fact that it allows a clearly magnified view for precise hemostatic dissection in a minimally invasive fashion, laparoscopic skin incisions are small_compared to the large incisions necessary in the open approach with its resultant postoperative morbidity ***(Jukka Sirén, 1999).***

# AIM OF THE WORK

The aim of this work is to review and discuss the role of laparoscopic adrenalectomy in the management of benign adrenal tumors as a new technique and its efficacy and advantages compared with open surgery.