International Journal of Surgery 28 (2016) S118–S123

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.journal-surgery.net

Review

Minimally invasive approach for adrenal lesions: Systematic review of laparoscopic versus retroperitoneoscopic adrenalectomy and assessment of risk factors for complications

G. Conzo [a, *], E. Tartaglia [a], C. Gambardella [a], D. Esposito [a], V. Sciascia [a], C. Mauriello [a], A. Nunziata [a], G. Siciliano [a], G. Izzo [a], F. Cavallo [a], G. Thomas [a], M. Musella [b], L. Santini [a]

[a] Unit of General and Oncologic Surgery, Department of Anesthesiologic, Surgical and Emergency Sciences, School of Medicine and Surgery Second University of Naples, Italy
[b] Advanced Biomedical Sciences Department, AOU "Federico II", Naples, Italy

ARTICLE INFO

Article history:
Received 3 April 2015
Received in revised form
18 April 2015
Accepted 10 May 2015
Available online 18 December 2015

Keywords:
Adrenal gland
Laparoscopic transperitoneal adrenalectomy
Posterior retroperitoneal adrenalectomy
Adrenal tumor

ABSTRACT

In the last decades, minimally invasive transperitoneal laparoscopic adrenalectomy has become the standard of care for surgical resection of the adrenal gland tumors. Recently, however, adrenalectomy by a mininvasive retroperitoneal approach has reached increasingly popularity as alternative technique. Short hospitalization, lower postoperative pain and decrease of complications and a better cosmetic resolution are the main advantages of these innovative techniques. In order to determine the better surgical management of adrenal neoplasms, the Authors analyzed and compared the feasibility and the postoperative complications of minimally invasive adrenalectomy approaches. A systematic research of the English literature, including major meta-analysis articles, clinical randomized trials, retrospective studies and systematic reviews was performed, comparing laparoscopic transperitoneal adrenalectomy versus retroperitoneoscopic adrenalectomy. Many studies support that posterior retroperitoneal adrenalectomy is superior or at least comparable to laparoscopic transperitoneal adrenalectomy in operation time, pain score, blood loss, hospitalization, complications rates and return to normal activity. However, laparoscopic transperitoneal adrenalectomy is up to now a safe and standardized procedure with a shorter learning curve and a similar low morbidity rate, even for tumors larger than 6 cm. Nevertheless, further studies are needed to objectively evaluate these techniques, excluding selection bias and bias related to differences in surgeons' experiences with this approaches.

1. Introduction

Since the first adrenalectomy performed by the English surgeon Thornton in 1889, only in these last decades thanks to improvement of endocrinology knowledge, a better diagnostic support, and especially to minimally invasive techniques, the adrenal surgery has seen an important step forward. The first successful laparoscopic transperitoneal adrenalectomy (LTA) was performed by Michel Gagner in 1992 [1]. Initially adopted to treat small benign tumors, nowadays it is considered the "gold standard" technique to treat a broad spectrum of functioning and non-functioning adrenal diseases with described cases of resection of masses up to 12–15 cm [2–6]. Currently indications to LTA for lesions >6 cm is still a matter of debate and experienced endocrine surgeons are divided between supporters [7–11] and detractors [12,13]. This safe and effective approach offers all the benefits of minimally invasive technique such as low morbidity rate, short hospitalization, improved cosmesis and a rapid recovery in addition to increasing patients' satisfaction and comfort [14]. Shortly after Gagner, Gaur et al. described an alternative minimally invasive technique, the

* Corresponding author. Department of Anaesthesiologic, Surgical and Emergency Sciences, Second University of Naples, Italy, Via Sergio Pansini 5 80131, Naples, Italy.
E-mail addresses: giovanni.conzo@unina2.it (G. Conzo), ernestart@msn.com (E. Tartaglia), claudiog86@hotmail.it (C. Gambardella), daniela.esposito82@yahoo.it (D. Esposito), valerio.sciascia@gmail.com (V. Sciascia), claudio.mauriello@live.it (C. Mauriello), annamed82@virgilio.it (A. Nunziata), giusicil@libero.it (G. Siciliano), graziellaizzo@live.it (G. Izzo), fabiocavallo@iol.it (F. Cavallo), guglielmo.thomas@mail.com (G. Thomas), mario.musella@unina.it (M. Musella), luigi.santini@unina2.it (L. Santini).

http://dx.doi.org/10.1016/j.ijsu.2015.12.042
1743-9191/

retroperitoneoscopic adrenalectomy (RA) [15,16]. This approach consists of two surgical variants, either a posterolateral or a true posterior approach [17–19]. Posterior retroperitoneoscopic adrenalectomy (PRA), was first popularized by Waltz et al., in 1996, and since the beginning appeared resulting in less postoperative pain and a faster recovery than LTA [20–24]. Despite an almost nonexistent mortality, minimally invasive adrenalectomy is still associated with complications rates ranging from 3 to 20% [2,7,25–28]. Advocates for the laparoscopic and retroperitoneoscopic approaches cite the advantage of each technique, but there is no published evidence that supports the superiority of one over the other. Most of the published literature is retrospective, with inadequate or no controls and with potential biases. The aim of this study was to perform a systematic review of English literature, comparing the intraoperative and postoperative complications of the LTA versus RA to identify whether one technique is superior.

2. Surgical technique

2.1. Laparoscopic transperitoneal adrenalectomy

According to Gagner, LTA is performed with patient in lateral decubitus position with the affected side facing upward and the operative table flexed just above the level of the iliac crest [1]. Can be used 3 ports for left-sided tumors, with one additional port if required, and 4 ports for right-sided tumors. The ports are commonly made at the umbilicus and the subcostal area in the anterior axillary and midclavicular lines, port sites could be modified at the discretion of the surgeon. The intra-abdominal pressure is kept at 12 mmHg. For left adrenalectomy, the left colonic flexure is mobilized along to Gerota fascia. Dissecting through the avascular plain between the pancreatic tail and the kidney, the spleen and the pancreatic tail are moved medially. In right adrenalectomy, the liver is mobilized along the lateral border of the inferior vena cava to control potential bleeding. Subsequently, the adrenal vein is identified and divided. The adrenal gland and the surrounding fat tissue are removed en bloc with a retrieval bag.

2.2. Retroperitoneoscopic adrenalectomy

According to Waltz, RA is performed with the patient in a prone jack-knife position, the back prepped and dropped, or in lateral decubitus position (flexed through the torso at a 45° angle), with the surgeon and assistant stand on the side of the operating adrenal gland [20]. The retroperitoneal space is entered posteriorly through a 12 mm transverse incision near to the tip of the 12th rib. A medial 10 mm trocar is placed along the border of the paraspinal muscle at a 45-degree angle pointing directly at the adrenal gland. A lateral 5 mm trocar is placed at the tip of the 11th rib. A 12 mm blunt balloon trocar is then introduced through the initial incision and CO_2 insufflation is established at a pressure of 25 mmHg. The dissection of the retroperitoneal fat tissue from the capsule at the upper renal pole is performed. After visualization of the inferior vena cava at the right side and the identification of the renal vein at the left side, the adrenal vein is divided. Subsequently, dorsal, lateral and cranial mobilization of the tumor is performed. The adrenal gland and the surrounding fat tissue are removed en bloc with a retrieval bag.

2.3. Classification of complication in adrenalectomy

Despite the low morbidity of rate of adrenalectomy, several and severe perioperative complications can occur and they can be classified into intraoperative and postoperative. The most frequent intraoperative complications are bleeding from adrenal and renal vein or adrenal cortex, vena cava injuries, diaphragmatic perforation and spleen laceration. Retroperitoneal hematoma, incisional hernia, pancreatic fistula, hyponatremia and intestinal injuries are the most common postoperative complications. Intraoperative complications may be defined using the Satava classification that identify three grades: (I) an error without consequences; (II) an error with identification and immediate correction, which may lead to recovery; (III) an unrecognized error leading to a significant consequence or complication [29]. A postoperative complication is defined as an event that occurred within 30 days after surgery, and it can be defined using the Clavien classification modified by Dindo [Table 1] [30].

3. Discussion

In a few years, adrenalectomy has progressed from an operation with a large incision and prolonged hospitalization to a minimally invasive surgery with reduced postoperative pain, rapid mobilization, better cosmesis and shorter hospital stay. Since its introduction in 1992, the surgical indications for LTA have been widely increased [1,26,31]. Nowadays the technique is worldwide considered as the “gold standard” procedure for adrenal gland tumors <6 cm and is also considered safe and feasible for larger masses in selected cases [32–34]. On the other hands, PRA, popularized by Waltz, is considered a valid minimally invasive alternative procedure for adrenal tumors, demonstrated feasible for tumors <8 cm [20,35]. Despite an almost negligible mortality, postoperative morbidity rate after minimally invasive adrenalectomy are in a range from 3 to 20% [2,36]. Considering the need for a standardized classification system for surgical complications, in 1992 Clavien et al. published a paper describing a new approach for their categorization [30]. The scoring system was modified in 2004 by Dindo to include complications associated with increased risk of death and disability. However, this classification includes only postoperative complications that have a major impact on patient wellness. In 2005, Satava suggested a simple classification to evaluate surgical errors during minimally invasive surgery [29]. The aim of communicating intraoperative incidence includes the primary need to reduce their occurrence and it might contribute to a refinement of the strategy and surgical technique. Satava described that when a mistake is made there are three possible outcome: (I) an harmless error which can go unobserved, almost never reported; (II) an error with immediate identification and correction, with minimal or no consequences for the patient; (III) an error with consequence that the surgeon made and not recognize leading to a significant complication [29].

Considering the complications rate after LTA and PRA, is really important to evaluate several preoperative risk factors which could affect morbidity incidence [Table 2].

Many studies demonstrate that the size of the mass and the histopathological diagnosis of pheochromocytoma were independent risks factors of the perioperative complications rate [28,33,37]. Castillo et al. showed that LTA in large adrenal masses (>8 cm) is associated with prolonged operative time, increased blood loss and longer hospitalization, without affecting perioperative morbidity [38]. In fact in this series, 3 patients with pheochromocytoma >5 cm in diameter showed complications > Clavien III. Many Authors considered the tumor dimension >12 cm a contraindication to LTA [39,40]. Apparently in contrast with this conclusion, several recent studies indicated that LTA might be performed safely even for masses up to 15 cm [3–6,41–43]. LTA has been described as an effective and safe approach, even for pheochromocytoma >6 cm in diameter, although patients with such large tumors may have a higher conversion rate and more intraoperative hypertensive crises, representing in case of laparotomic conversion the first