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The posterior adiposity index: a quantitative selection tool for adrenalectomy approach

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ABSTRACT

Background: Objective criteria are lacking to determine whether a laparoscopic transabdominal (LA) or retroperitoneoscopic (RP) approach to adrenalectomy is optimal. We hypothesized that imaging characteristics could predict patients for whom RP adrenalectomy is the optimal approach.

Materials and methods: Retrospective cohort study of all patients undergoing minimally invasive adrenalectomy between 2014 and 2016 ($n = 113$) at one institution. Imaging measurements included distances between the skin and Gerota's fascia (S-GF), upper borders of adrenal and kidney (A-K), adrenal and 12th rib (A-R), 12th rib and iliac crest (R-IC), and perinephric fat (PNF). These characteristics plus patient body mass index, gender, age, tumor size, and diagnosis were compared with operative time and estimated blood loss using Pearson's correlation or ANOVA. Multivariable linear regression also identified independent predictors of operative time.

Results: Half of patients underwent LA ($n = 57$) and RP adrenalectomy ($n = 56$). Median age was 57 y; 60% were female. Mean tumor size was 3.2 cm. Higher body mass index patients were more likely to undergo LA ($P = 0.03$). Increasing lesion size modestly correlated with longer operative time ($r = 0.341$). On bivariate analysis, S-GF and PNF distances moderately correlated with operative time ($r = 0.464$ and 0.494) for RP procedures. The sum of S-GF and PNF generated a Posterior Adiposity Index (PAI). The PAI strongly correlated with operative time for RP ($r = 0.590$). Nothing was significantly associated with estimated blood loss. Multivariate analysis revealed larger lesions ($P = 0.025$) and increasing PAI ($P = 0.019$) were predictive of longer operative time, with PAI ≥ 9 conferring the greatest risk ($P = 0.004$).

Conclusions: Smaller tumors and PAI <9 are associated with shorter operative times in RP adrenalectomy. Surgeons can utilize preoperative images to calculate the PAI and determine whether an RP approach would be favorable.

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Introduction

Laparoscopic transabdominal adrenalectomy (LA) was first described in 1992[1] and became the gold standard for minimally invasive adrenalectomy for many years. Although it was initially described in the 1995, retroperitoneoscopic adrenalectomy (RP) was not routinely implemented until publication of modified techniques by Walz in the mid-2000s.[2,3] With both techniques being widely utilized at many centers, there is a need to clearly determine which patient populations will be best served by each approach to adrenalectomy.

Early studies of RP adrenalectomy suggested patients with tumors <6 cm, patients with bilateral tumors, or history of upper abdominal surgery should be considered for this approach.[4,5] Agcaoglu *et al.* described their algorithm to select patients for RP adrenalectomy,[6] but no studies have evaluated factors associated with operative time or estimated blood loss (EBL) without predetermined selection into one group *versus* another.

We sought to determine whether anthropometric characteristics on preoperative imaging studies can be used to identify which patients should be considered for RP adrenalectomy, without application of any prespecified criteria to guide the surgical approach.

Methods

A retrospective review was conducted of all adult patients at one tertiary care hospital that underwent minimally invasive adrenalectomy from January 2014 to December 2016. Patients were excluded if a preoperative CT or MRI study was not available within the radiology system archive. The outcome variables measured were skin-to-skin operative time and EBL, as recorded on the anesthesia data sheet. Our predictor variables included patient age, gender, body mass index (BMI), tumor size, tumor laterality, attending surgeon, diagnosis, and anthropometric imaging characteristics (Fig. 1).

Anthropometric characteristics of interest were measured in centimeters. The rationale for inclusion and definition of each is as follows: the skin and Gerota's fascia (S-GF) (distance from the 12th rib tip to Gerota's fascia)—depth required for initial port placement; perinephric fat (PNF) (distance between the kidney parenchyma and Gerota's fascia or the posterior abdominal wall at the level of the 12th rib tip)—distance traversed in the initial dissection and creation of retroperitoneal working space; R-IC (vertical distance from the 12th rib tip to the most superior point on the iliac crest)—narrow space can result in difficulty placing ports and achieving the optimal angle to dissect the adrenal

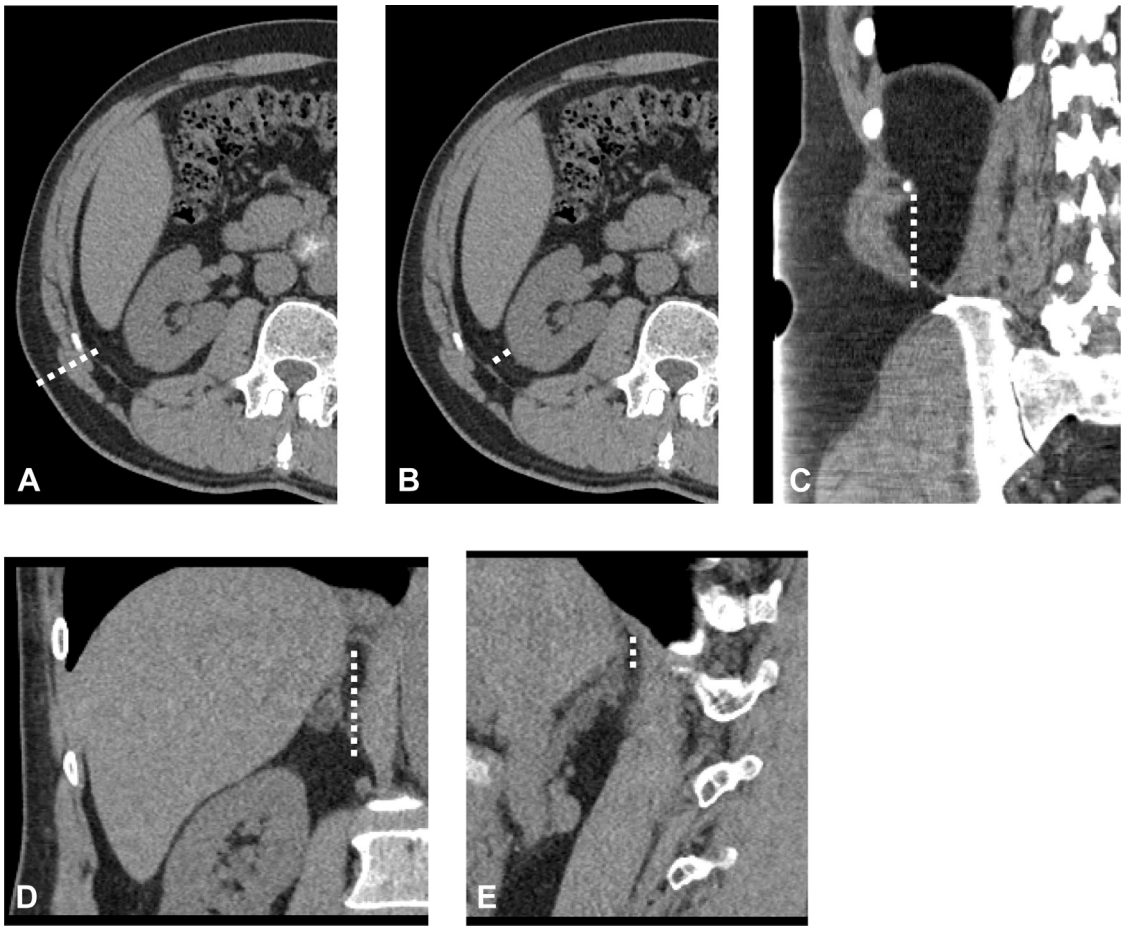

Fig. 1 – Anthropometric imaging characteristics. (A) S-GF, skin-Gerota's fascia distance; (B) PNF, perinephric fat distance; (C) R-IC, rib-iliac crest distance; (D) A-K, top of adrenal-kidney distance; (E) A-R, adrenal-12th rib tip distance.