

# Right adrenal gland prospective evaluation through transgastric endoscopic ultrasound: an alternative approach

## Authors

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## Bibliography

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**Background and aims:** Endoscopic ultrasound (EUS) guided right adrenal gland (RAG) evaluation is frequently unsuccessful and, when feasible, requires a cumbersome maneuver through the duodenum. In our experience, the use of a recent ultrasound platform has enabled transgastric detection of the RAG with a simple maneuver. The aim of this study was to determine the RAG transgastric EUS detection rate and identify predictive factors for failure.

**Methods:** Consecutive patients referred to EUS in a single center were prospectively included over a 6-month period. Success was defined as RAG

transgastric EUS detection within 180 seconds. Logistic regression analysis was used to assess factors associated with failure.

**Results:** Among 100 patients, the success rate for RAG transgastric EUS detection was 75%, with a median maneuver duration of 45 seconds [interquartile range, 25–70 seconds]. Two incidental RAG lesions were detected. Of possible demographic and anthropometric predictive factors for failure, only age (OR 1.04;  $P=0.04$ ) was statistically significant on multivariate analysis.

**Conclusions:** The transgastric EUS approach for RAG detection is simple, fast and effective.

## Introduction

Adrenal incidentalomas are frequent findings on abdominal imaging, with up to 9% incidence reported in autopsy series [1]. Current guidelines recommend a standard evaluation, focusing on the diagnosis of otherwise unrecognized malignant or benign secretory tumors, as well as follow-up of lesions not fulfilling criteria for surgical resection [2]. Moreover, the adrenal is also a frequent site of metastasis, thus requiring careful evaluation for cancer staging [3].

In this regard, endoscopic ultrasound (EUS), one of the most valuable diagnostic procedures for conditions involving the gastrointestinal tract and adjacent structures, has so far failed to reach its full potential. Although the left adrenal is almost always easily detected on transgastric EUS, right adrenal gland evaluation (RAG) continues to be a diagnostic pitfall, best seen in up to 20–30% of patients through a cumbersome maneuver during transduodenal imaging from the third portion of the duodenum [4,5].

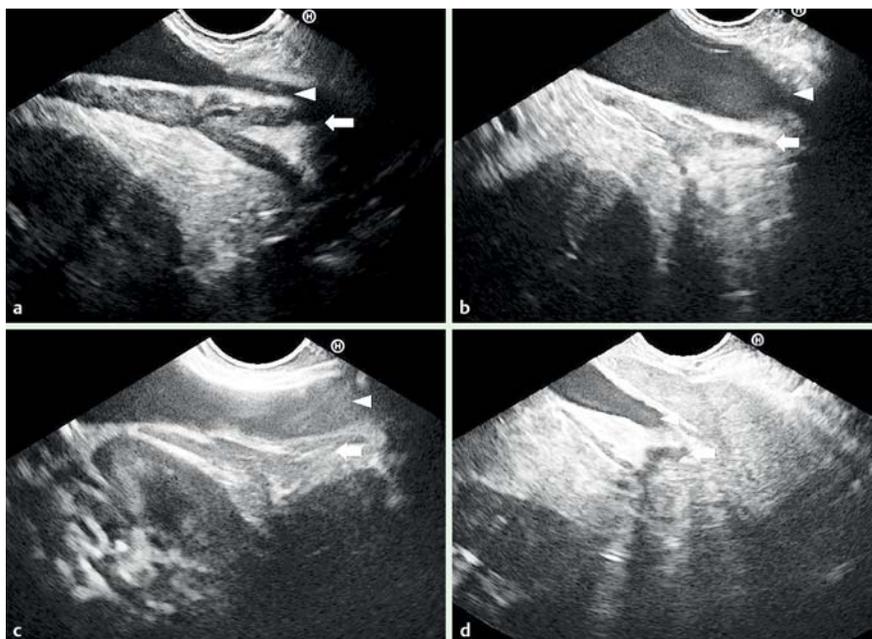
In our experience, the use of a recent ultrasound platform has enabled transgastric detection of the RAG in a simple maneuver. We aimed to measure the RAG transgastric EUS detection rate and identify predictive factors for failure.

## Material and methods

This was a prospective study of consecutive patients referred to EUS in a single center over a 6-month period. Following Hospital da Luz Healthcare Ethics Committee approval, every patient undergoing EUS was invited to participate and asked to sign a written informed consent. Using a form developed in advance, an EUS nurse collected clinical data including: age, gender, race, weight, height, and previous abdominal surgery. All exams were performed under propofol anesthesia by a single expert operator (with 1000 procedures/year) with a Pentax EG 3870 UTK ultrasound endoscope (Pentax Medical, Tokyo, Japan) and HI VISION Preirus ultrasound platform (Hitachi Medical Corp., Tokyo, Japan). After completion of the formal standard EUS evaluation, the operator performed a specific maneuver for RAG evaluation and timed the duration of the procedure. Success was defined as RAG transgastric EUS detection and photodocumentation within 180 seconds. Data were analysed using SPSS (version 22) software. Logistic regression analysis was used to assess factors associated with failure and Chi-Square and Mann–Whitney tests for group comparisons. A sample size of 100 patients was calculated for the logistic regression

## License terms





**Fig. 1** a–d Four examples of right adrenal gland transgastric evaluation. The right adrenal gland (RAG) (arrow) is viewed behind the inferior vena cava (arrowhead) with a “gullwing” shape and a hypoechoic appearance.

based on the number of covariates ( $k=6$ ) and the expected failure rate ( $P=70\%$ ) using the guideline proposed by Peduzzi et al. ( $N=10k/p$ ), and further increased to 100 as suggested by Long [6, 7]. Statistical significance was set at  $P<0.05$ .

### EUS technique

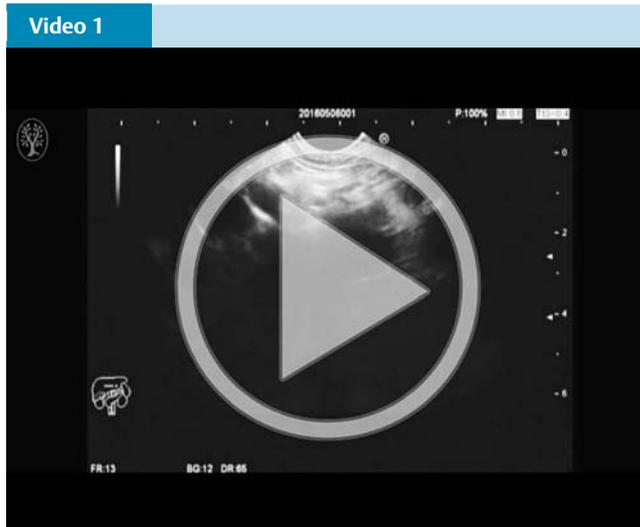
After identifying the celiac trunk take-off (time=0 seconds), a counterclockwise  $90^\circ$  rotation was performed, bringing the inferior vena cava (IVC) into view with the caudate lobe (segment I) anterior to the vessel. The next step was to slowly push the linear scope with small torque clockwise/counterclockwise movements in order to keep the IVC in view and evaluate the fat plane just behind the IVC, where the RAG came into view (● Fig. 1, ● Video 1).

### Results

In total, 100 patients were enrolled in this study (63 female; median age 63 [interquartile range, 50–71] years, mean height  $164\pm 9$  cm [range 144–190 cm] and weight  $69\pm 13$  kg [range 44–110 kg]; mean body mass index [BMI]  $25\pm 4$  [range 17–38]). Of these, 15 patients had undergone previous upper abdominal surgery. No patient refused to participate in the study. The most common EUS indications were subepithelial lesion and pancreatic mass/cyst evaluation. The success rate for RAG transgastric EUS detection was 75%, with a median maneuver duration of 45 seconds (interquartile range 25–70 seconds; range 10–153 seconds). Two incidental RAG lesions were detected: a small hypoechoic mass and a small hyperechoic mass, suggestive of an adenoma and a myelolipoma, respectively (● Fig. 2).

Of possible demographic and anthropometric predictive factors for failure, only age (OR 1.04; 95%CI 1.001–1.08;  $P=0.04$ ) was statistically significant on multivariate analysis. There was a tendency for failure in obese patients ( $BMI\geq 30$  kg/m<sup>2</sup>) but this was not statistically significant (OR 2.57;  $P=0.127$ ).

On a post-hoc analysis, the study sample was divided into two groups to assess whether, along the study period, an increased operator experience yielded greater RAG detection rate and lower maneuver duration. Although a greater mean RAG detection

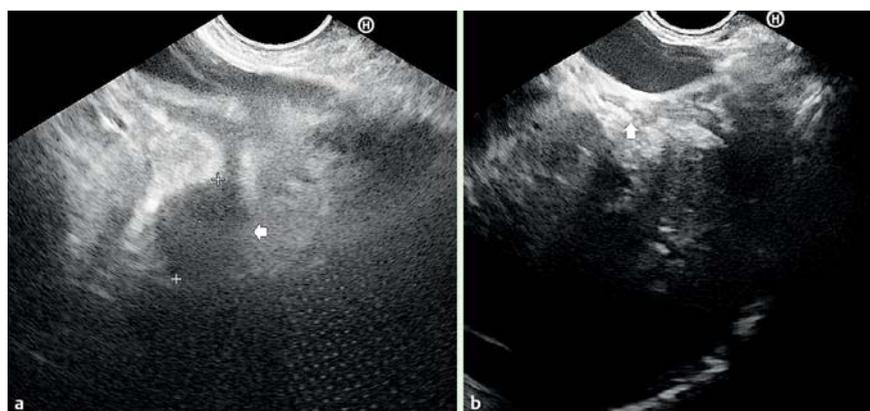


After identifying the celiac trunk take-off, a counterclockwise  $90^\circ$  rotation is performed, bringing the inferior vena cava (IVC) into view with the caudate lobe (segment I) anterior to the vessel. Next, the linear scope is slowly pushed with small torque clockwise/counterclockwise movements in order to keep the IVC in view and evaluate the fat plane just behind the IVC, where the right adrenal gland (RAG) comes into view. Online content including video sequences viewable at: <http://dx.doi.org/10.1055/s-0042-116147>

rate (70% vs 80%,  $P=0.248$ ) and lower median maneuver duration (45 vs 40.5 seconds;  $P=0.106$ ) were indeed found in the second group, these differences were not statistically significant.

### Discussion

Although the most common adrenal gland incidentaloma is the nonfunctioning adenoma (around 80% of patients), current guidelines recommend patient referral to an endocrinologist for thorough clinical, biochemical, and imaging investigation to exclude a functional tumor or malignancy. Even if a benign adenoma is suspected, biochemical and imaging follow-up is necessary



**Fig. 2** a Right adrenal gland (RAG) with a round hypoechoic 17 mm mass (arrow); b RAG presenting a 6 mm hyperechoic lesion (arrow).

to check for lesion enlargement or transformation into a functioning adenoma [2]. Considering this, the addition of systematic RAG evaluation to an upper EUS complete exploration may increase the yield of significant additional diagnosis (i. e. previously unknown and unsuspected EUS finding that requires further study), previously reported in 11% of patients [8]. In our study, two RAG incidentalomas were found and patients were instructed to consult with their referring physician.

RAG EUS evaluation has long been described in the literature but the success rate is usually low, around 20–30% [4,5]. More recently, Uemura et al. reported a high success rate (87.3%); however, this finding has not yet been replicated [9]. Nevertheless, whatever the case, a difficult maneuver is necessary requiring that the echoendoscope be placed in the duodenum, below the level of the papilla, and rotation and/or tip deflection be applied. For this reason, in our experience, RAG evaluation is not routinely performed. On the other hand, transgastric visualization of the RAG as described in this study is a simple technique and has been shown to be relatively fast and effective. It must be emphasized, however, that if RAG tissue sampling is required, a previously described duodenal approach for fine needle aspiration should be used, to avoid injuring the IVC [10].

In two patients, failure to view the RAG could be explained by the presence of a large hiatal hernia precluding a thorough IVC evaluation. Interestingly, with other loco-regional anatomic challenges, such as gastric or pancreatic cancer, the RAG was detectable in the majority of patients. In the remaining patients in whom the RAG could not be viewed, the fat plane behind the IVC could not be accurately evaluated due to ultrasound beam attenuation. However, the reason why this was associated with increasing age is not known.

Limitations of this study include the use of a conveniently recruited sample and that all EUS exams were performed in a single-center by a single expert operator using a recent EUS proces-

sor, undermining the generalizability of our results. Further studies are needed to demonstrate whether our findings are reproducible by other centers.

In conclusion, in this study, we describe a simple, fast, and effective technique for RAG evaluation, with the potential to increase the diagnostic yield with EUS.

**Competing interests:** None

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