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Partial Prostatectomy for Anterior Cancer: Short-term Oncologic and Functional Outcomes

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Abstract

Background: Focal ablative therapy may be a suboptimal option for anterior prostate cancers (APCs) reaching the prostate apex due to concerns for thermal injury to the external sphincter. **Objective:** To explore the technical feasibility of anterior partial prostatectomy (APP) for isolated APCs detected by magnetic resonance imaging (MRI), and to report short-term oncologic and functional outcomes.

Design, setting, and participants: Following institutional review board approval, over an 8-yr period (2008–2015) 17 consenting patients were enrolled in a prospective single-arm single-center Innovation, Development, Exploration, Assessment, Long-term (IDEAL) phase 2a study. Inclusion criteria comprised preurethral, low- to intermediate-risk APC diagnosed by MRI, and targeted biopsies. Robotic template APP was performed; posterolateral aspect of the sub-montanal urethra, peripheral zone, and periprostatic tissues were preserved intact. Median follow-up was 30 mo (interquartile range [IQR]: 25–70).

Outcome measurements and statistical analysis: We noted the incidence of perioperative complications and examined reports of pathology, prostate-specific antigen (PSA), imaging, biopsies, and questionnaires.

Results and limitations: Preoperatively, median PSA was 9.8 ng/ml, Gleason score was 6–7 (3 + 4), and cancer volume was 3.7 cm³ (IQR: 1.7–4.6). The technique was feasible in all cases. Perioperative complications included anastomotic leak (12%; G2), urinary tract infection (6%; G2), and transient intestinal ileus in one case (6%; G2). At 3 mo, continence and potency rates were 100% and 83%, respectively. Median nadir PSA was 0.4 ng/ml (IQR: 0.3–0.7). All margins and posterolateral margins rates were 55% and 35%, respectively. APC recurrence-free survival at 2 yr was 0.86 (95% confidence interval [CI], 0.55–0.96). Four patients (24%) who recurred underwent an uncomplicated completion of robot-assisted prostatectomy. Regarding limitations, CIs are quite wide for reported outcomes.

Conclusions: Robotic partial prostatectomy for isolated APC is feasible with good functional results. While promising, much more research is needed to verify our initial outcomes and appropriately position APP in the treatment paradigms for APC.

Patient summary: We explored a novel approach for partial prostatic surgical ablation for prostate cancer located in the anterior part of the prostate as an alternative to other focal ablative techniques.

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1. Introduction

Energy-based partial gland ablation is an emerging treatment for localized intermediate-risk prostate cancer (PCa) that aims to reduce the morbidity associated with radical whole-gland therapy while delivering cancer control [1,2]. These focal therapies are adapted to PCa location, such as the peripheral zone (PZ), transition zone (TZ), or anterior fibromuscular stroma (AFMS) [3].

Use of magnetic resonance imaging (MRI) and targeted biopsies has led to better detection and localization of PCa, such as diagnosing anterior prostate cancers (APCs) originating from the TZ. APCs account for 19% of new cancers [4–7]. We demonstrated that APCs originate from the anterior and medial TZ as well as anterior to the urethra in the midline [8,9]. Probably due to benign prostatic hyperplasia (BPH), some APCs spread anteriorly into the AFMS; then the anterior limit of the TZ acts as a barrier to APCs extending posteriorly [4].

An APC nodule can occasionally be located mainly within the AFMS and anterior to the TZ boundary without any cancer in the PZ. In these highly selected cases, which represent 3–5% of new cancers (Supplement 1), focal or partial treatment is appealing. However, delivering thermal energy to an apical APC may be undesirable [3], for fear of compromising the external sphincteric unit and/or the neurovascular bundles.

In this specific circumstance, we believe that en bloc surgical excision of the anterior prostate (ie, TZ, AFMS, anterior part of the PZ) would preserve intact the posterolateral aspect of the distal (submontanal) urethra, PZ, and periprostatic tissues. Doing so would effectively ablate the tumor with a safety margin of benign tissue posteriorly, deliver superior continence/potency outcomes versus radical prostatectomy (RP), and allow pathologic assessment of excised tissue. PSA nadir would still potentially be an accurate marker for oncologic control, and a complementary RP or ablative therapy could be performed in case of cancer recurrence, with oncologic and functional outcomes similar to RP.

The objective of our study was to evaluate the feasibility and oncologic and functional outcomes of robot-assisted anterior partial prostatectomy (APP) for isolated MRI-detected APC in a highly selected cohort.

2. Patients and methods

2.1. Study population

This study used a prospective single-arm single-center stage 2a Innovation, Development, Exploration, Assessment, Long-term (IDEAL) paradigm [10]. The robot-assisted APP technique innovation was carried out by a few surgeons, deemed to be probably safe after the first five cases, and was tested more broadly, although still experimental, in well-selected patients. The intervention needed to be refined. A regulatory process was required at this stage, and the study was approved by the institutional review board at the University of Lille, France, where all cases were treated. After detailed information was given to the patients, written signed consent was obtained. Assessing safety for the first five cases was based on bleeding (no transfusion), functional results at 6 mo

(International Continence Society [ICS] score ≤ 4), and oncologic results (at least two of three cases with negative lateral/posterior margins). After five consecutive surgeries in an 18-mo period, the investigators decided to pursue the study. The decision to analyze the results after 17 patients was established empirically (median follow-up >24 mo was reached).

Inclusion criteria comprised a multiparametric MRI (mpMRI)-identified, predominantly anteriorly located tumor. It was proven at targeted biopsy (two cores per lesion) and determined to be at low or intermediate risk [11,12]. Cancer could be of any volume at MRI, provided its posterior limits were at least 17 mm (posterior biopsy core length) anterior to the rectal surface of the gland that defines the anterior location of cancers, and its lateral limits were within the TZ or AFMS. The whole prostate gland could be of any volume [13]. Exclusion criteria were if the posterior aspect of the APC at MRI was located <5 mm anterior to a coronal plane located at the level of the posterior TZ boundary (Fig. 1) or MRI-targeted biopsies Gleason score (GS) >7, an anterior bulging of the tumor beyond prostate boundaries or extension in the preprostatic fat or bladder neck (BN), a cancer length >3 mm at 12 systematic posterior biopsies in an adjacent sector to the anterior cancer, or an additional clinically significant PZ cancer (>3 mm of cancer on one core at 12 systematic posterior biopsies or at MRI-targeted biopsies to a secondary posteriorly located lesion at MRI). Patients who refused to consent were offered RP, radiation therapy, and/or active surveillance. Over an 8-yr period (January 2008 to December 2015), 28 patients fulfilled the entry criteria, of whom 17 (60%) gave informed consent and were enrolled in the study.

All patients underwent prebiopsy mpMRI, followed by MR-targeted biopsies to any visible lesion, plus a 12-core systematic transrectal ultrasound-guided biopsy. Self-administered validated quality-of-life (QOL) questionnaires were used to assess preoperative urinary function (International Prostate Symptom Score [IPSS]), continence (ICS: 1–2), and potency (International Index of Erectile Function [IIEF]-5). Potency was defined as an IIEF-5 score ≥ 20 with or without drugs. Preoperative mpMRI protocol was performed within 3 mo of surgery and included axial (and sagittal, if necessary) gadolinium-enhanced sequences to assess the contour and the craniocaudal extent of the biopsy-proven cancerous area [8].

2.2. Surgical technique

Robotic surgery consisted of en bloc excision of the anterior part of the prostate composed of the AFMS, BN, prostate adenoma (TZ and median lobe) along with the proximal prostate urethra, PZ apical anterior horns, anterior aspect of the distal (submontanal) urethra, and anterior BN (Supplement 1, Fig. 1). Only three cases had lymph node dissection due to suspicious enlarged pelvic node enlargement at MRI ($n = 2$) and GS 4 + 3 ($n = 1$).

Perioperative data including peri- and postoperative treatment-related adverse events, and time to bladder catheter removal were recorded. Cancer location, volume, and margins were assessed according to the Stanford technique [14]. We differentiated positive posterior surgical margins at the posterior aspect of the excised specimen from anterior surgical margins that are an artifact occurring when preprostatic fat is removed during exposure in patients with APC. Patients with a positive posterior margin underwent mpMRI and biopsy of the PZ within 3 mo after surgery. We recommended that patients with a positive biopsy have a robot-assisted salvage nerve-sparing RP (Supplement 1).

All patients underwent PSA monitoring at 3 and 6 mo and then every 6 mo and had mpMRI at 6–12 mo. At 6 mo, protocol-based 12-core and/or targeted biopsies were performed in the first seven patients. Because biopsies were negative when MRI was not suspicious, only for-cause biopsies were performed in the remaining 10 patients. Self-administered

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