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Comparison of prostatic adenocarcinoma Gleason 5 and intraductal carcinoma of the prostate with tumor necrosis. A morphometric study

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ABSTRACT

Intraductal carcinoma of the prostate(IDCP) is defined as a solid or cribriform neoplastic growth confined to ducts and acini, with preservation of the basal cell layer. Since IDCP can often present tumor necrosis (TN), it should be distinguished from Gleason 5 (GP5) invasive adenocarcinoma for staging and clinical purposes. In the present study we reviewed 344 radical prostatectomies performed at our institution and selected all cases with either > 5% GP5 or IDCP for assessment of TN on histology slides (n = 59). A total of 19 cases with TN were identified, and morphology, size, location, and histoarchitecture of the lesions with TN were recorded. Subsequently, the corresponding sections were stained with a basal cell immunomarker (P63), and lesions with TN were assigned to IDCP or invasive carcinoma GP5 for comparison. Our results show that a branched shape and size 501–1000 μm are more common in IDCP, while a size > 1000 μm and location within 1 mm of the periprostatic soft tissue are significantly more prevalent in invasive adenocarcinoma GP5. These features, however, usually cannot be assessed in core biopsies. In this setting, the utilization of immunohistochemistry is warranted to differentiate IDCP and GP5 with necrosis.

1. Introduction

The first description of what we now know as intraductal carcinoma of the prostate (IDCP) is attributed to Hugh H. Young, who in 1909 observed the “spread of carcinoma by way of the ducts” in a prostatectomy specimen [1]. In the mid ‘80s, Kovi et al. documented the mechanisms of ductal spread of prostate cancer (PCa) [2], followed by the recognition of the clinical significance of IDCP by McNeal et al. a decade later [3]. The most widely used definition of IDCP was provided by Guo and Epstein, who empirically described the lesion as malignant epithelial cells filling acini and ducts, with preservation of basal cells and either one of: (1) solid or dense cribriform architecture, (2) loose cribriform or micropapillary architecture with marked nuclear atypia (nuclear size > 6Å~ normal) or comedonecrosis [4]. In view of this definition, the potential for confounding invasive PCa Gleason 5 (GP5) containing tumor necrosis (TN) with IDCP has been identified as a significant diagnostic pitfall [5]. In this study we compare the histomorphology, distribution and size of these two lesions, to identify characteristics that may aid in their differentiation.

2. Materials and methods

This study was conducted with approval of the Office for the Protection of Research Subjects (OPRS) of the University of Illinois at Chicago.

Three independent searches for radical prostatectomies performed at the Hospital of the University of Illinois at Chicago between January 2011 and December 2016 were executed using the intradepartmental PathNet® Anatomic Pathology: Pathology Case Retrieval software (Build: 2016.05.1.89). Appropriate terms were successively used to identify radical prostatectomies performed between 2011 and 2016, IDCP, GP5 > 5% + IDCP, GP5 > 5%. The rationale of querying the database for IDCP initially was that, if a sufficient cases with IDCP were present, an exhaustive review of all cases with GP5 could be avoided. Among 344 consecutive radical prostatectomies found, only 1 case with IDCP mentioned in the report was identified. The search for cases with > 5% GP5 retrieved 59 specimens with slides available for review, including the only case with IDCP mentioned above.

Prostates of less than 40 g were entirely embedded and submitted for microscopic examination. Depending on the instructions of the

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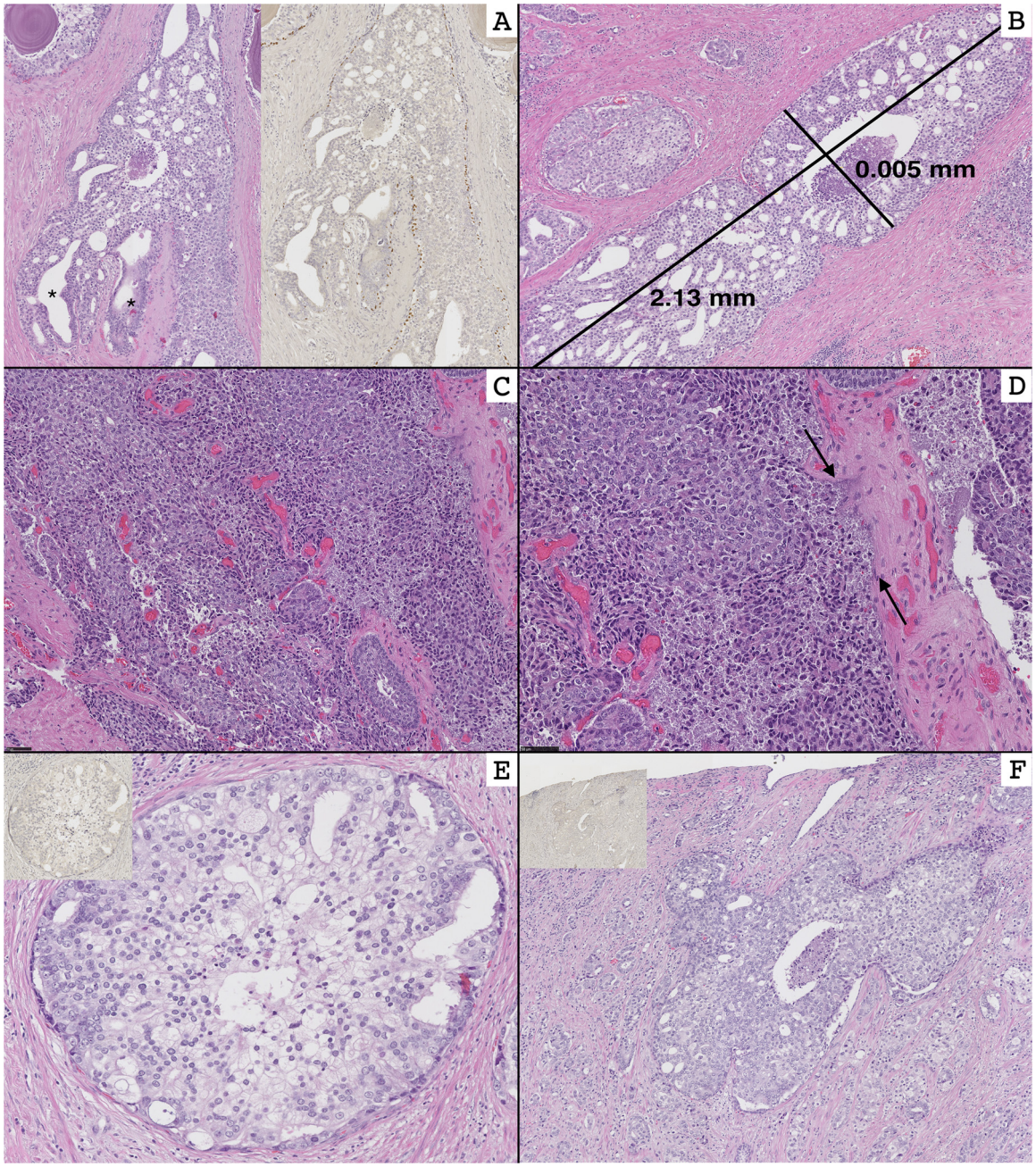

Fig. 1. (a) Intraductal carcinoma of the prostate with tumor necrosis (IDCP-N) showing branched shape. Note the basal-cell lined structure with multiple branches (stars) (p63 immunohistochemical stain on right showing basal cells, original magnification 80×). (b) IDCP-N showing elongated shape with the glandular measurements depicting the length is greater than three times the width (original magnification 100×). (c) Diffuse lesion of GP5-N with mostly well-defined borders (original magnification 80×). (d) Higher magnification of image from part c showing a cluster of neoplastic cells with focal "blurring" between the arrows (original magnification 150×). Blurring consists of tumor cells progressively blending into the stroma. (e) Round GP5-N with dense cribriform architecture (p63 immunohistochemical stain, original magnification 100×). (f) Cribriform IDCP-N with irregular shape and traditional Gleason pattern 3 and 4present in periphery (p63 immunohistochemical stain, and H&E original magnification: 100×).

attending pathologist, larger specimens were either submitted entirely or representatively sampled. For representatively sampled glands, alternate entire levels plus the complete capsule for all levels was embedded, unless otherwise instructed by the pathologist. Slides corresponding to the 59 cases mentioned above were evaluated for the presence of TN, defined as a group of cells with clear karyorrhexis, pyknosis, cytoplasmic condensation and accompanying eosinophilic necrotic debris [6]. We also described 3 patterns of TN: punctiform (> 4 and < 10 necrotic cells), focal (> 10 necrotic cells and no features of diffuse TN) and diffuse (coalescing TN without a well-delineated margin and/or > 3 foci of punctiform TN within a discrete group of tumor cells) [6].

Hematoxylin and Eosin stained slides were initially reviewed by 5 pathologists (AMA, MRHAR, EV, AS, KSM) for the assessment of predefined histoarchitectural, morphometric and topographic characteristics in lesions with TN. The following information was collected for each individual lesion: size (≤500 µm, 501–999 µm and ≥1000 µm), shape (round, irregular, elongated, branched and diffuse), location (peripheral zone, central zone, transition zone, central prostate not otherwise specified and marginal location) and pattern of TN. Size was measured under the microscope with an optical ruler. For elongated and branched lesions, size corresponds to the largest diameter