

## Frozen section evaluation of margins in radical prostatectomy specimens: a contemporary study and literature review☆☆☆☆



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### ARTICLE INFO

#### Keywords:

Frozen section  
Prostate cancer  
Positive surgical margin  
Radical prostatectomy  
Biochemical recurrence

### ABSTRACT

The utility of routine frozen section (FS) analysis for margin evaluation during radical prostatectomy (RP) remains controversial. A retrospective search was conducted to identify RPs evaluated by FS over a 5-year period. The potential of FS to discriminate between benign and malignant tissue and to predict final margins was evaluated. During the study period, 71 (12.3%) of 575 cases underwent FS evaluation of margins, generating 192 individual FSs. There were 8 FSs diagnosed as atypical/indeterminate because of significant freezing, crushing, and/or thermal artifacts; 11 as positive for carcinoma; and 173 as benign. Two FSs classified as benign were diagnosed as positive for carcinoma on subsequent permanent section. Frozen sections' sensitivity, specificity, positive predictive value, negative predictive value, and accuracy for diagnosis of prostatic adenocarcinoma were 85%, 100%, 100%, 99%, and 99%, respectively. Overall RP final margin predictive accuracy was 81%. Positive FS was significantly associated with perineural invasion on biopsy and extraprostatic extension and higher stage disease on RP, but not with the overall final margin status. The high FS accuracy supports its use to guide the extent of surgery. However, FS cannot be used to predict the overall final margin status. Recognition of the histological artifacts inherent to the FS procedure is important to ensure appropriate utilization.

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### 1. Introduction

Numerous studies have documented the negative impact of positive surgical margins on biochemical recurrence in radical prostatectomy (RP) [1–5]. Patients with positive surgical margins have a higher rate of biochemical recurrence and local disease recurrence and require radiotherapy in addition to surgical treatment. Cumulative evidence has

shown that margin status is associated with surgical experience and procedure modality [6–14]. Frozen section (FS) analysis may be performed for intraoperative evaluation of margin status during RP, optimization of nerve-sparing procedures [15,16], and evaluation of metastatic disease in pelvic lymph nodes [17–20]. Depending on preoperative and intraoperative evaluation by the urologist, FSs may be taken at the apex/distal urethra, bladder neck/base, posterolateral/neurovascular bundle, and seminal vesicles. Evaluation of benign prostatic glands at surgical margin may also be of value in view of its possible effect on postoperative prostate-specific antigen (PSA) levels and as prognostic indicator of biochemical failure [21,22].

Positive surgical margins at RP have been reported in approximately 10% to 40% of cases. The utility of intraoperative FS evaluation of margins at RP is a matter of debate, and despite the presence of a large amount of literature on this topic, there is no consensus on its use [23–30]. Adding to this controversy are the pitfalls that can occasionally be seen during evaluation of FSs. These include artifacts, such as crush or electrocautery, which can make interpretation challenging [31]. These artifacts may direct the pathologic interpretation toward an inconclusive diagnosis, leaving the urologist with the difficult decision of whether to remove the additional tissue. In addition, the ability to achieve negative surgical margins after a positive FS may be affected by the small amount of soft tissue surrounding the prostate [1].

☆ Presented in part at the 100th USCAP annual meeting, San Antonio, TX, 2011.

☆☆ Disclosure/conflict of interest: The authors declare that they have no relevant financial interests.

★ Financial support: This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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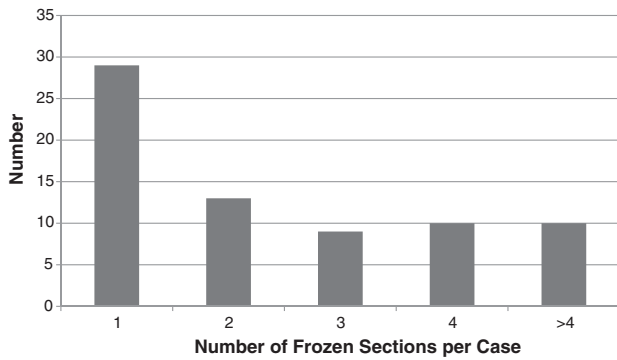
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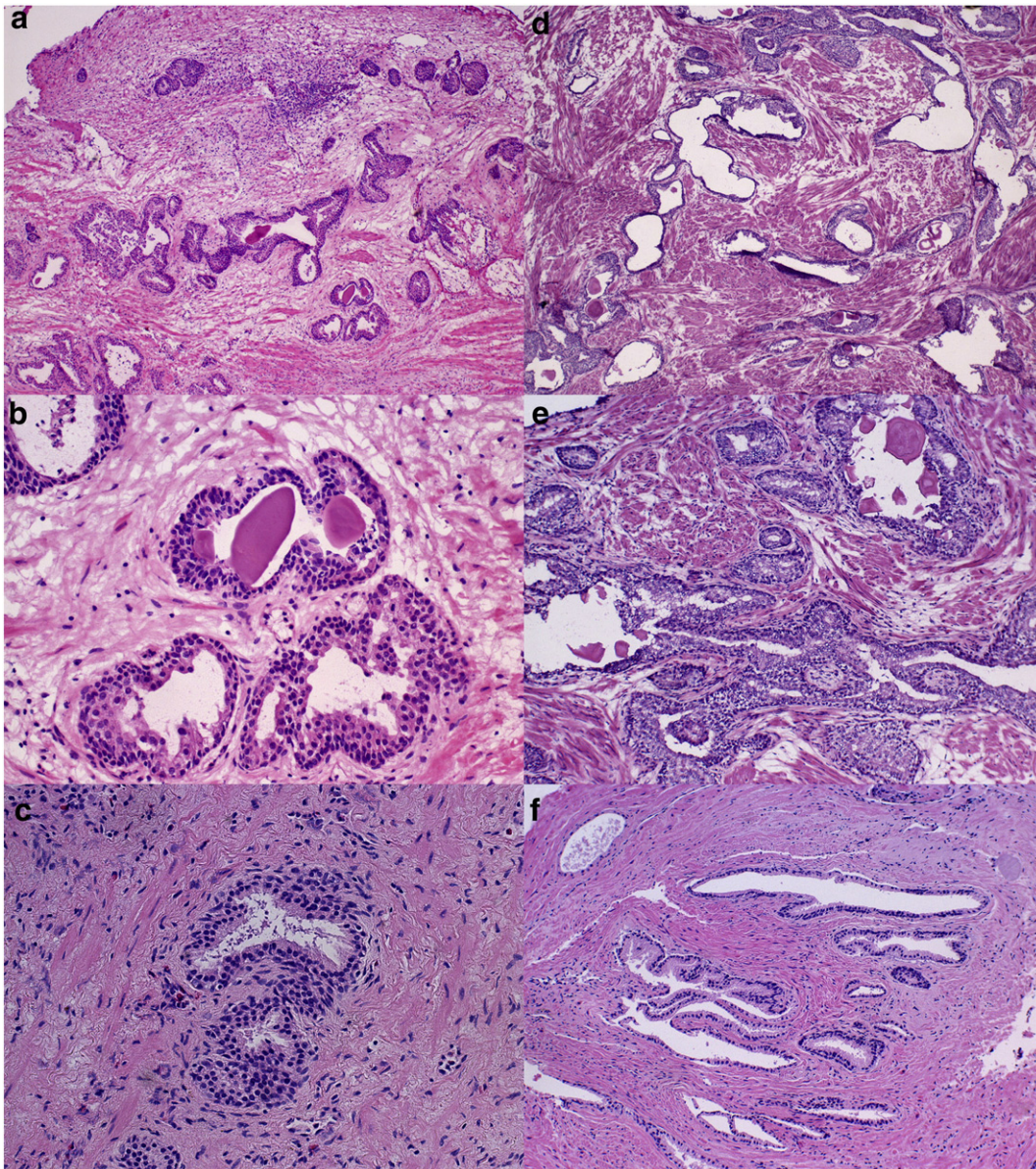
**Fig. 1.** Number of frozen sections (FS)s performed per case. The range of FSs was between 1 and 10 with a mean of 2.65 and median of 2.0 FSs.

In this study, we describe our experience with intraoperative FSs at RP. As part of this, we evaluated the utility of FS in discriminating between benign and malignant tissues and identified possible associations between positive FSs and clinicopathologic features at prostate biopsy and RP.

## 2. Materials and methods

### 2.1. Case selection and histological review

A retrospective search of RP specimens evaluated over a 5-year period (November 2004 to November 2009) was performed to identify all cases that were evaluated intraoperatively by FS. These included cases obtained through both laparoscopic and robotic-assisted procedures and excluded those that required FS solely to evaluate for presence of



**Fig. 2.** Benign glands on frozen section (FS). The first case (A-C) shows large glands with undulating apical contours on FS (A, B) and prominent basal cells on permanent section (PS) (C). The second case (D-F) demonstrates large glands in lobular patterns on both FS (D, E) and PS (F) (hematoxylin and eosin).

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