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Paper

Ganglion cells in the human prostate

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Prostate carcinoma infiltrating around ganglion cells is claimed to be diagnostic of extracapsular extension because ganglion cells are only found in periprostatic soft tissue. However, the presence of autonomic ganglion cells in the fibrous capsule of the prostate has been reported. In this study, we aimed to define the exact localization of the ganglion cells in radical prostatectomy specimens. Slides of 64 totally embedded radical prostatectomies were reviewed. The ganglion cells were noted as *outside the gland* if no relation could be defined with prostate capsule or prostatic glands. They were noted as *in the capsule* when ganglion cells were observed inside the capsule, which was easily and definitely discerned. Ganglion cells were noted as *in the prostate* when ganglion cells were observed beneath the capsule *and* in close proximity to the prostatic glands. Also, the ganglion cells were noted as *in the capsule* if they were observed inside the capsule but not adjacent to the prostatic glands, and as *outside the prostate* when the capsule could not be easily defined and distant from the prostatic glands. Ganglion cells were observed *in the prostate* in 12 cases (18.75%). There was no relationship of these ganglion cells with the tumor in the prostatectomy specimens. Ganglion cells were located *in the capsule* in 14 cases (21.9%). The ganglion cells were observed *outside the prostate* in the other 38 cases (59.4%). These results show that there may be ganglion cells *in the prostate*. Therefore, defining ganglion cell invasion by the tumor as extracapsular invasion may lead to staging error and cause erroneous management of the disease. Presence of carcinoma in ganglion cells should be recorded by defining whether these structures are within or outside the prostate gland. *Prostate Cancer and Prostatic Diseases* (2000) **3,** 34–36.

Keywords: prostate; ganglia; cancer staging

Introduction

Carcinoma of the prostate is the second most common cause of cancer-related death and is the most common malignant neoplasm among men.[1] Definitive diagnosis of prostatic carcinoma is based on its histopathologic recognition in needle biopsy specimens.

In earlier editions of his textbook, Jonathan I Epstein claimed that the finding of tumor infiltrating around ganglion cells is diagnostic of extracapsular extension because ganglion cells are only found in periprostatic soft tissue.[2] However, Vaalasti and Hervonen have reported the presence of autonomic ganglion cells in the fibrous capsule of the prostate.[3] In this study, we aimed to define the exact localization of the ganglion cells in radical prostatectomy specimens.

Materials and methods

Slides from 64 radical prostatectomy specimens that were performed between 1991 and 1998 were re-evaluated. All of the radical prostatectomy specimens were completely embedded in the same manner. The outer surface of the gland was inked and the gland was fixed for 24–48 h in 10% buffered formalin and then cut at 3 mm intervals

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with the aid of a dissector. All the sections were divided into four pieces and numbered consecutively as 1A–D, 2A–D, etc, 1 representing the proximal end, A right upper, B left upper, C right lower, and D left lower quadrant. The sections were processed in the routine manner, paraffin-embedded, and 5 μm thick sections were cut. All of the sections were hematoxylin–eosin stained.

All of the slides were reviewed by each of the two authors (KY and BT). Ganglion cells were sought at the pericapsular region. When ganglion cells were observed, their location and relation to prostatic glands, prostate capsule and other structures were determined. Per case, 52–120 sections (mean ± s.d.: 74.5 ± 14.7) were submitted.

The ganglion cells were noted as *outside the gland* if no relation could be defined with prostate capsule or prostatic glands. They were noted as *in the capsule* when ganglion cells were observed inside the capsule, which was easily and definitely discerned. The prostatic glands outside the prostate capsule were noted when the capsule was definitely estimated, and ganglion cells were noted as *in the prostate* when ganglion cells were observed beneath the capsule, which was, again, easily and definitely discerned *and* if the ganglion cells were in close proximity to the prostatic glands that were not the glands outside the prostate capsule.

The ganglion cells were noted as *in the capsule* if they were observed inside the capsule but not adjacent to the prostatic glands. Also, they were noted as *outside the prostate* when the capsule could not be easily defined and distant from the prostatic glands.

Results

Fourteen of the 64 radical prostatectomy specimens were unilateral or bilateral nerve sparing. The age of 64 cases ranged between 53 and 75 with a mean of 63.4. The tumor was confined to the prostate gland in 29 cases (45.3%; stage T_2). Invasion through prostate capsule was identified in 31 cases (48.4%; stage T_3), and there was invasion to the adjacent structures in four cases (6.3%; stage T_4). The Gleason score was 3, 4, 5, 6, 7, 8, 9 and 10 in 1, 2, 12, 19, 18, 7, 4 and 1 cases, respectively. The cancer volumes ranged between 0.1 and 80 cm^3 (mean ± s.d.: 7.2 ± 11.6). The surgical margins were positive in 20 cases (31%).

Ganglion cells were observed *in the prostate* in 12 cases (18.75%; Figures 1 and 2). In eight of these cases, ganglion

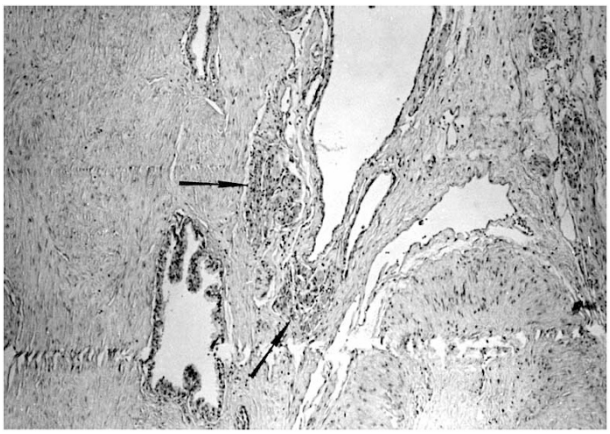


Figure 1 *Two small groups of ganglion cells (arrows) between prostatic glands beneath the prostate capsule are seen.*

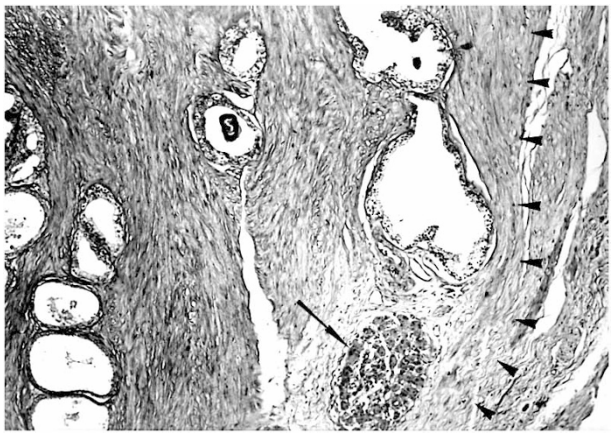


Figure 2 *A group of ganglion cells (arrow) near a prostatic gland adjacent to the prostate capsule (arrowheads).*

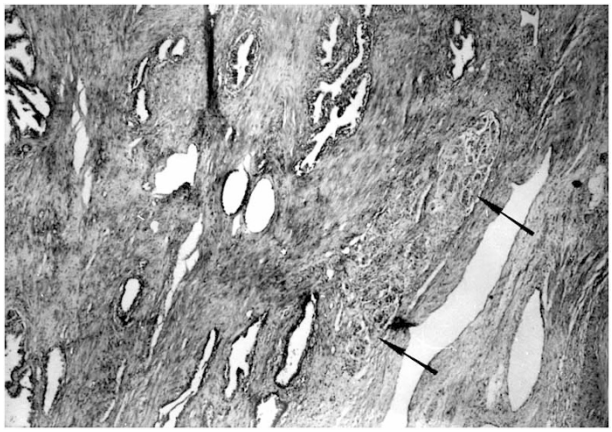


Figure 3 *Ganglion cells (arrow) located in the prostate capsule.*

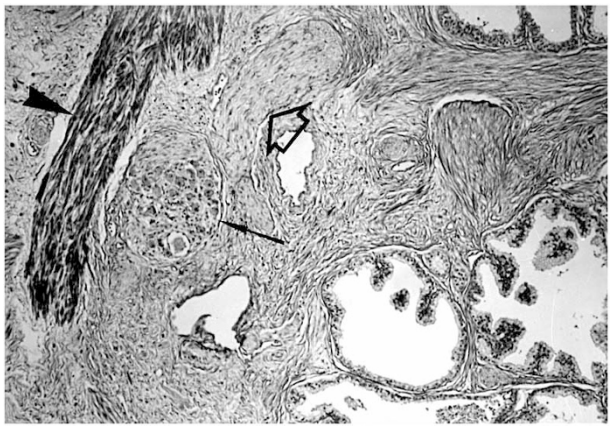


Figure 4 *Ganglion cells (arrow) adjacent to striated muscle cells (arrowhead) and peripheral nerve (open arrow) at a significant distance from the prostatic glands.*

cells were noted in the prostate in only one section. Ganglion cells were defined in two and four different sections in two and two cases, respectively. There was no relationship of these ganglion cells to the tumor in the prostatectomy specimens.

Ganglion cells were located *in the capsule* in 14 cases (21.9%; Figure 3). Of these, in six cases the ganglion cells were near prostatic glands, but the capsule was not easily discernible, and therefore noted as *in the capsule*. The ganglion cells were observed *outside the prostate* in the other 38 cases (59.4%) (Figure 4).

Discussion and conclusions

In earlier studies, ganglion cells were shown to be located in the prostate capsule.[3] In this study, we have shown ganglion cells in the prostate as well as prostate capsule, in a significant proportion of the cases. The criteria for defining ganglion cells *in the prostate* was designated strictly. The ganglion cells when observed just near the prostatic glands and beneath the prostate capsule were accepted as *in the prostate*. When the prostate capsule could not be strictly defined, the ganglion cells were accepted as *in the capsule* in six cases. In these cases, the ganglion cells may actually be located *in the prostate*. However, it is clear that there may be ganglion cells *in the prostate*. Therefore, defining ganglion cell invasion by the tumor as extracapsular invasion may lead to staging error and cause to erroneous management of the disease. Epstein later defined ganglion cell invasion as not equating to extracapsular invasion of tumor.[4] As College of American Pathologists and The Association of Directors of Anatomic and Surgical Pathology's recommendations, presence of carcinoma in ganglion cells should be recorded by defining whether these structures are within or outside the prostate gland.[5,6] Extracapsular tissue involvement should be noted if periprostatic connective tissues and/or fibroadipose tissue invasion is observed.

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