

Full Length Research Paper

A study on the prevalence of prostatic cancer among forensic autopsy cases

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In the aging society, elderly people often suffer cancer, which is associated with increased rates of fractures due to osteoporosis from cancer. In the present study, the prevalence of prostatic cancer, so-called "latent adenocarcinoma", is investigated among forensic autopsy cases. Retrospective histopathology was performed on 114 subjects (61.8 ± 13.3 years old). Forth-four specimens (38.6%) harbored carcinomas with Gleason combined scores ranging from 3 to 9. The detection rate increased in accordance with age, in which the highest rate (8/13, 61.5%) was evident in the group of ≥ 80 years of age. However, no significant associations were apparent to age ($P = 0.13$) or body mass index ($P = 0.36$). Majority (34, 77.2%) displayed solitary lesions that were located mainly in the peripheral zone. Advanced capsular invasion was evident in five cases. The prostate that is not familiar to forensic pathologists should be examined in extrinsic fractures of the elderly because cancer might affect injury severity.

Key words: Forensic pathology, prostate, gleason score, histopathology, elderly.

INTRODUCTION

In the highly aging society, an accident specific to the elderly is sometimes encountered. For instance, we experienced such a case in which a cyclist in his eighties fell down the street in a collision with another bicycle. In spite of the slight hit, he was found dead on the way home after the accident. Multiple fractures of his ribs and vertebrae were evident at autopsy. The victim suffered bone metastases of prostate carcinoma with the past hormone-based therapy. Cancer is not exclusively a disease of the aged, but older people more commonly suffer from cancer. This fact means that aging is associated with increased rates of bone fractures

originated from osteoporosis from cancer (Drake, 2013). We intended to know the pathological features of the organs to which forensic pathologists are not familiar.

Prostate cancer, which is a slow-growing tumor, displays a long latency. Adenocarcinoma of the prostate is characterized by heterogeneous features concerning histology and clinical behavior. Most histological prostate carcinomas remain clinically silent; moreover, relatively few become malignant with invasion to the pelvic organs and bone (Brawn et al., 1995). A number of carcinomatous changes were detected incidentally in the prostate during autopsy and subsequent histology, so-

Table 1. Age and gleason score in latent adenocarcinomas of the prostate.

Age	40-49	50-59	60-69	70-79	80~	Total
Number (n)	20	33	27	21	13	114
Gleason score						
7-9	1	3	2	3	4	13
2-6	5	9	9	4	4	31
Subtotal*	6 (30.0%)	12 (36.4%)	11 (40.7%)	11 (33.3%)	8 (61.5%)	44 (38.6%)

*Cancer detection rates are indicated in parentheses.

called 'latent' or 'occult' carcinoma. Histological findings obtained after autopsy have indicated a high incidence of morphological abnormalities of the glands in 20 to 50% of cases (Brawn et al., 1995). Takahashi et al. (1992) reported that the incidence rose up to approximately 60% in the Japanese elderly of 90 years old and more. However, only a limited attention has usually been paid to the prostate tissues in forensic autopsy practice. In the present study, the prevalence of prostatic cancer is investigated among the routine forensic autopsy cases, and the significance of pathological examination to the prostate tissues is demonstrated.

MATERIALS AND METHODS

A total of 114 Japanese males, over 40 years of age with a mean age of 61.8 ± 13.3 years, were examined from full autopsy cases in our forensic department during a period of two years from 2009 to 2011. Half of the subjects died of cardiac sudden deaths like ischemic heart disease, and a variety of traumatic deaths were also included. Subjects who had clinical history of any malignant carcinomas were excluded. As long as checking the investigation file from the police was done, clinically intervened osteoporosis was not also included. The histological evaluation was retrospectively performed as previously described (Tian et al., 2004). Briefly, the prostate and seminal vesicle were fixed in 10% buffered formalin for one to two weeks. All glands were cut along at least three planes at intervals of 5 mm perpendicular to the urinary tract. Paraffin-embedded tissues were prepared from both lateral lobes along the parallel planes. For histological evaluation, sections 4 μ m in thickness were stained with Mayer's hematoxylin and eosin.

Tumors were classified according to the Gleason scoring system by summation of the two Gleason pattern grades, ranging from 1 to 5, at primary and secondary lesions (Gleason, 1992). The diameter of each tumor was estimated by measuring the largest representative section. However, the present retrospective study contained limitations such as no information regarding metastasis status of the bone and lymph node in the pelvic area.

RESULTS

Histopathological examination to 114 prostate glands from males ≥ 40 years of age revealed that 44 (38.6%) specimens harbored carcinomas with evaluation of the Gleason system. Gleason combined scores were distributed from 3 to 9 according to microscopic examination. Table 1 summarizes subject number with

respect to age, including tumor detection rate, and to Gleason combined score. Subjects were divided into five groups according to age at 10-year intervals. Gleason combined score is classified into two groups: < 7 and ≥ 7 . Average ages (\pm SD) of histologically normal subjects and those in whom cancer was detected were 60.8 ± 12.4 and 63.5 ± 14.4 years, respectively. The detection rate increased in accordance with age; furthermore, the highest rate (8/13, 61.5%) was observed in the group comprised of individuals ≥ 80 years of age. However, no significant associations were apparent between the incidental tumor and physical conditions within strata of age ($P = 0.13$) or body mass index ($P = 0.36$). Thirty-six cases (81.8%) displayed solitary carcinomatous lesions, whereas the remaining cases were characterized by multi-focal lesions (Table 2). Lesions ranged from 2 \times 2 mm to 20 \times 35 mm in size of sections; more than half (29 of 44) of the lesions were smaller than the maximum 10 mm diameter. Table 3 summarizes the localization in the organ with major site in the peripheral zone. Capsular penetration as advanced stages was evident in five cases, in which the carcinomas did not relate with the cause of their deaths at all.

DISCUSSION

Carcinomatous changes of the prostate have been known among pathological autopsy cases from the old days of 19th century (Andrews, 1949). During the last two decades, advanced diagnostic procedures, including laboratory examination based on prostate-specific antigen (PSA) and needle biopsy, have further demonstrated the prevalence of adenocarcinomas of the prostate in adult males. To date, it is likely that latent carcinomas simply occur in middle-aged individuals in whom clinical examinations are not performed, and in the elderly in whom tumor detection has failed. The positive incidence of 38.6% of the total Japanese subjects in this study appears to be consistent with studies of other ethnic groups (Hsing et al., 2000). The incidence of latent carcinomas detected upon histological examination is known to be similar among various population groups (Breslow et al., 1977; Sakr et al., 1995). However, the prevalence appeared to be relatively higher than that of

Table 2. Size and multiplicity.

Area size	Solitary (%)	Multiple (%)
< 100 mm	21 (47.7)	3 (6.8)
≥ 100 mm	15 (34.1)	5 (11.4)

Table 3. Location of the tumor.

Localization	Number (%)
PZ	23(52.3)
CZ	5 (11.4)
PZ + TZ	12(27.3)
PZ + CZ + TZ	4 (9.1)
Total	44 (100)

PZ, peripheral zone; CZ, central zone; and TZ, transitional zone.

an earlier investigation of a Japanese population by Yatani et al. (1982). The incident rate is known to increase in accordance with age (Leal et al., 2014), but the significant value was not obtained in the present study, in which the age distribution was not adjusted.

In contrast to the compatible incidence of latent carcinomas among population groups, the incidence of malignant transformation from clinically insignificant tumors differs between Western and Asian countries (Yatani et al., 1982). Prostate carcinomas are becoming a common male malignancy in Japan, exhibiting mortality approximately four times that of the decade of the 1990s; however, associated deaths remain fifth among all cancers at 17.6 individuals per 10 population in 2011 (at http://www.jcancer.jp/about_cancer_and_checkup). Prostate cancer is the second most common cause of cancer mortality in the United States, in which the incidence among African Americans remains more than 10 times that of the East Asian population groups (Zhu et al., 2009; Siegel et al., 2014).

In several studies, forensic autopsy has provided materials to clinicians in order to investigate the prevalence of latent adenocarcinoma of the prostate among a population (Zare-Mirzaie et al., 2012). From a forensic point of view, PSA and the prostate have been extensively investigated for the evidence of semen concerning rape (Levine et al., 2004). However, forensic pathologists need to examine the prostate tissues pathologically from the carcinomatous aspect in the rapid aging society of Japan (Kido et al., 2015), in which a number of accompanied geriatric problems are apparent. Few latent carcinomas metastasize the pelvic or para-aortic lymph nodes (Brawn et al., 1995), but it is possible that bone fractures observed in the elderly are associated with osteoporosis accompanied by cancer metastasis. The bone and peripheral lymph nodes were not examined in the present study, but we realize to perform another

prospective study regarding metastatic status.

Conclusion

Silent adenocarcinoma of the prostate is prevalent in the male over middle age. When injuries of the elderly, in particular long bone fractures, was severe than those deduced from the death scene investigation, forensic pathologists need to pay attention to the possibility of involvement of prostate cancer.

Conflict of Interest

The authors have not declared any conflict of interest.

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