Epidemiology of Prostate Cancer and Benign Prostatic Hyperplasia

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Abstract

Prostate cancer and benign prostatic hyperplasia are two major prostate diseases that increase with aging. The incidence rates of both diseases are currently showing a tendency to increase. In particular, increases in the incidence rate and the number of deaths from prostate cancer are noteworthy. It is predicted that the number of affected individuals will exceed those of gastric cancer, placing it second to lung cancer by the year 2020. The United States of America has the highest incidence of prostate cancer, and mortality from prostate cancer is second only to lung cancer, but there has been a decrease in mortality from prostate cancer since the 1990s. A contributing factor to this decrease is that more than 90% of detected cases are localized cancers, with metastatic cancers accounting for only about 5%. In contrast, in Japan, the sum total of metastatic or locally invasive prostate cancers account for 35% of detected cases, reflecting a serious problem of increasing deaths among patients. Effective future measures including screening are important.

Key words   Prostate cancer, Benign prostatic hyperplasia, Epidemiology

Introduction

The life expectancy of Japanese men is 79.19 years (2007 Abridged Life Table), and prostate cancer and benign prostatic hyperplasia, the incidence rates of which are known to increase with aging, have become more and more common in this country. In particular, the incidence rate of prostate cancer is showing a rapid rise, accompanied with a similar trend in the number of deaths from this disease. This paper provides an overview of the epidemiologic features of these two diseases.

Epidemiology of Prostate Cancer

Incidence rate

The age-adjusted incidence rate of cancer by site in Japanese men (adjusted using the 1985 model population) was highest for gastric cancer, followed by lung cancer, colon cancer, liver cancer, rectal cancer, and prostate cancer in descending order until 2000. In 2001, prostate cancer ranked fifth, surpassing rectal cancer.[1] In 2002, the incidence rate was 31.6 (per 100,000 population) for liver cancer, and 31.4 for prostate cancer, suggesting that prostate cancer would rank fourth in 2003. It is expected that this tendency to an increasing incidence of prostate cancer will continue further, and the number of patients is predicted to rise to a level second only to lung cancer by 2020 (**Fig. 1**).[2]

In addition, in terms of the number of patients, another index of analysis, patients with prostate cancer were most common among all cancer patients aged 65 years or older in 2005, and were generally high among those in their 50s or older, based on the 2005 patient survey by the Ministry of Health, Labor and Welfare (**Table 1**).[3]

Mortality rate

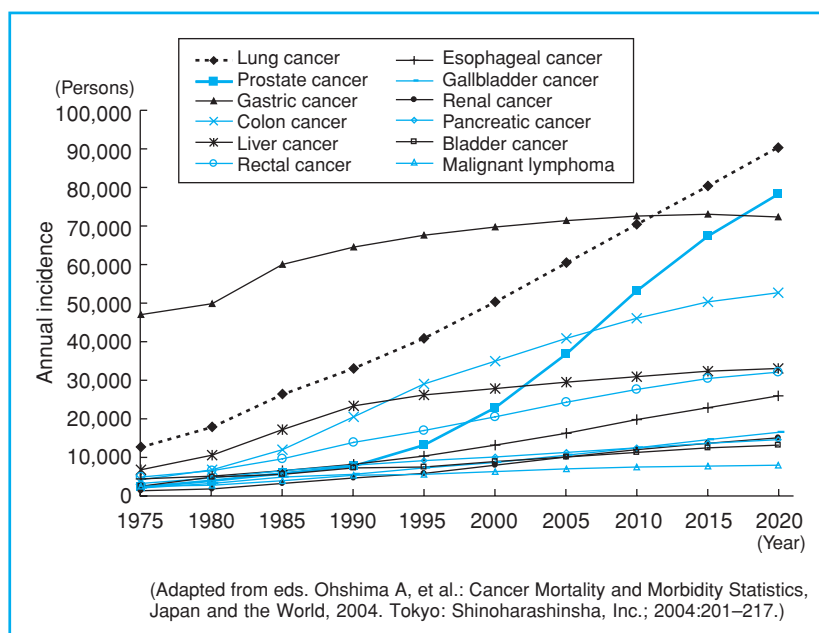In Japan, the age-adjusted mortality rate of pros-

Fig. 1 Predictions of the numbers of various cancer patients

Table 1 Ranking of the number of patients by cancer site based on the 2005 patient survey
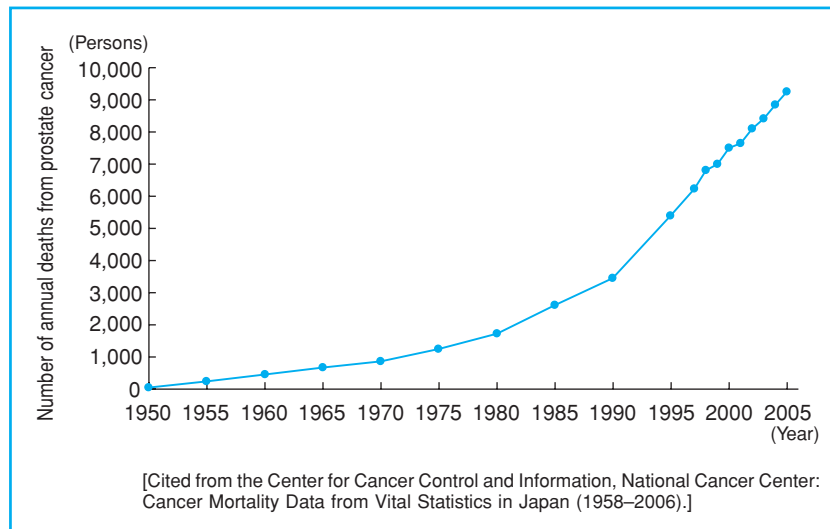
Age (yr)	Ranking						
	1	2	3	4	5	6	7
50–54	Stomach	Lung	Colon	Liver	Bladder	Rectum	Prostate
55–59	Stomach	Lung	Colon	Prostate	Rectum	Liver	Bladder
60–64	Stomach	Prostate	Lung	Colon	Liver	Rectum	Bladder
65–69	Prostate	Stomach	Lung	Colon	Liver	Bladder	Rectum
70–74	Prostate	Stomach	Lung	Colon	Liver	Bladder	Rectum
75–59	Prostate	Stomach	Lung	Colon	Bladder	Liver	Rectum

(Produced from ed. Statistics and Information Department, Minister's Secretariat, Ministry of Health, Labour and Welfare: 2005 Vital Statistics in Japan.)
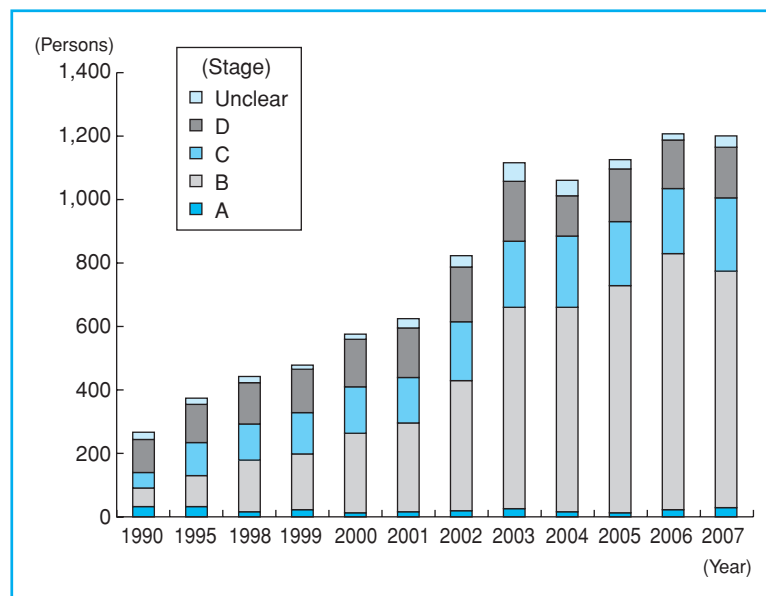
tate cancer was as low as 0.5 per 100,000 population in 1950, but then increased to reach 3.2 in 1970 and increased further to 8.6 in 1998, about 2.7-fold the figure in 1970. The mortality rate decreased slightly in 1999, and remained at a level of 8.4–8.6 thereafter with a figure of 8.5 in 2005.[1] This rate ranked eighth following lung cancer, gastric cancer, liver cancer, colon cancer, pancreatic cancer, esophageal cancer, and rectal cancer. On the other hand, the number of deaths from prostate cancer has shown a tendency to increase rapidly: the figure 2,640 in 1985 increased to 5,399 in 1995 and 9,265 in 2005 (**Fig. 2**).[4]

Although the number of deaths from prostate cancer is increasing sharply, the age-adjusted mortality rate has been approaching a plateau, a reflection of the aging population. The type of cancer death also contributes to this discrepancy.

(Persons)

Number of annual deaths from prostate cancer

[Cited from the Center for Cancer Control and Information, National Cancer Center: Cancer Mortality Data from Vital Statistics in Japan (1958–2006).]

Fig. 2 Number of deaths from prostate cancer

(Persons)

(Stage)
Unclear
D
C
B
A

Fig. 3 Trends in distribution of prostate cancer stages at diagnosis (Gunma Prefecture)

Various treatment options are available for elderly patients, such as for those with advanced prostate cancer with metastasis after endocrine therapy or death after a long course of recurrence in patients who underwent radical treatment for localized cancer. The discrepancy between the number of deaths and the age-adjusted mortality rate is a characteristic feature of prostate cancer.

Prostate cancer registry of the Japanese Urological Association and trends in prostate cancer patients in Gunma Prefecture

Along with issuance of the revised third edition of the "General Rules for Clinical and Pathological Studies on Prostate Cancer" prescribed by the Japanese Urological Association and the Japanese

Society of Pathology, a national prostate cancer registry was developed in conjunction with the Japanese Urological Association playing a central role in this task. A total of 4,529 patients diagnosed with prostate cancer from 173 facilities in 2000 were registered, and their clinical characteristics were reported in 2005.[5] More than 25% of the patients were aged 70–74 years, and those aged 60–79 years accounted for more than 75%. According to the TNM classification, T2b or milder cases accounted for 65.1%, N0 for 78.8%, and M0 for 71.6% of these cancers. Data representing more than 90% of all prostate cancer cases in Gunma Prefecture indicated that stage B cases increased markedly, while stage C and D cases were still substantial, accounting for about 35% (**Fig. 3**).

International comparison[6]

According to worldwide 2002 Global Cancer Statistics, there are about 680,000 patients with prostate cancer per year. Prostate cancer accounted for 11.7% of all cancers in males, ranking second only to lung cancer. The incidence rate adjusted for age in the world population is 25.3 (per 100,000 population), which is ranked second, surpassing gastric cancer. The incidence rate is highest in North America, followed by Australia, Europe, and Africa. Prostate cancer is least frequent in Asia.

There are 221,000 deaths from prostate cancer annually in the world, accounting for 5.8% of all cancer deaths. The age-adjusted mortality rate is 8.2, ranking sixth after lung cancer, gastric cancer, liver cancer, colorectal cancer, and esophageal cancer.

The incidence rate of prostate cancer is highest, about 140 (per 100,000 world population per year), for African Americans, followed by Caucasian Americans and Canadians. Europeans such as Swedes, Germans, and the English are in the middle, while Asians such as Japanese, Indians, and the Chinese have low incidence rates. International variations also exist in the mortality rate of this cancer; it tends to be higher in Northern Europe.

According to the Surveillance, Epidemiology, and End Results (SEER) study in the US, the incidence rate of prostate cancer began to increase rapidly in the late 1980s, reaching a peak in 1992. Although there was a decrease after 1992, the incidence rate showed a tendency toward another increase after 1995. Thereafter, a slight decrease was observed from 2001 to 2003.

In contrast, the mortality rate showed a constant decrease from 1993 to 2003. Yearly trends in the mortality rate were divided into four periods, i.e., 1975 to 1987 characterized by a 0.9% increase, 1987 to 1991 by a 3.1% increase, 1991 to 1994 by a 0.6% decrease, and the decade from 1994 to 2003 showing a 4.0% decrease. A comparison between data in 1990 and 2003 revealed 12.0 (per 100,000) or 31.12% decrease from 38.56 in 1990 to 26.56 in 2003, and it was reported that this decrease contributed by 24.8% to the overall decrease in mortality from all cancers.

In regard to stage, all localized and regional cases coded as "localized/regional" accounted for 91%, and the 5-year relative survival rate was 100% for localized/regional cases, 33% for distant metastasis cases, and 100% for all stages.

Epidemiology of Benign Prostatic Hyperplasia

Although it is difficult to determine the number of patients with benign prostatic hyperplasia, patient surveys indicated that the total number of patients was 319,000 in 1996, 334,000 in 1999, 398,000 in 2002, and 459,000 in 2002 in Japan. According to National Livelihood Surveys (health questionnaires), the total number of patients was 590,000 in 1998, 793,000 in 2005, and 984,000 in 2004. Although there are variations in actual figures according to different subject populations and methods of survey, the statistical data demonstrate an increase in patients with benign prostatic hyperplasia.

As with the number of patients, it is also difficult to determine the frequency of benign prostatic hyperplasia. Based on an analysis of autopsy cases, Berry et al. reported that adenoma was histologically identified in 20%, 40%, 70%, and 80% of patients in their 40s, 50s, 60s, and 70s, respectively.[7] On the other hand, Swyer reported that the prostate would begin to atrophy and lose weight in some men in their late 40s, while the weight of the prostate would increase linearly in others.[8] A study by a Gunma University group found that the weight of the prostate did not increase with age in 30–40% of men.[9] Some men showed an increase in the weight of the organ in their 50s, and such persons increased among those in their 60s. In men aged 70 years or older,

those who had a prostate of 30 g or heavier accounted for more than 30%. A community-based survey also found that there were three groups of persons, i.e., those who had a prostate that increased, atrophied, or did not change with aging.[10]

On the other hand, benign prostatic hyperplasia is considered to be a disease that affects the quality of life (QOL) of the patient, and, in this regard, assessment of the frequency of subjective urinary symptoms is important. Masumori et al. carried out a community-based study including 289 subjects to investigate trends in the international prostate symptom score (I-PSS), bother score, and QOL score according to age groups over a follow-up period of 3 years.[11] They reported that the above three dysuria-related scores tended to elevate with increasing age both at the initial evaluation and in 3 years. When the relationship between age and the distribution of I-PSS was examined for subjects of prostate cancer screening in Gunma Prefecture, there was a tendency for the proportion of moderate or severe cases to increase with aging for each item of the I-PSS. In particular, higher proportions of moderate or severe cases were noted for items concerning the frequency of urination during the night, difficulty urinating, and urgency of urination. In regard to urination during the night, about 14% of subjects in their 70s and about 33% of those in their 80s reported that they got out of bed 3 times or more for urination.

In 2003, the Neurologic Bladder Society in Japan reported the results of a survey on 10,096 randomly selected male or female subjects aged 40 years or older.[12] Among men, the prevalence rates of urinary symptoms (occurring once a week or more/once a day or more) were 37.0%/27.9% for weak urine flow, 26.3%/18.0% for sensation of residual urine, 15.8%/8.7% for urinary urgency, and 7.3%/4.5% for urge incontinence. Concerning frequent urination, 12.5% of the male subjects reported 11 or more urinations during the daytime, and 16.7% reported 3 or more urinations during the night. An analysis by age group revealed that the prevalence rates of these items increased with aging. The tendency of age-related increase was particularly prominent for weak urine flow, urinary urgency, urge incontinence, and urination during the night.

Conclusion

Available epidemiologic data show that the incidence rates of both prostate cancer and benign prostatic hyperplasia have been increasing markedly. In particular, there is a distinct increase in the incidence rate and mortality rate of prostate cancer, but the age-adjusted mortality rate is reaching a plateau, reflecting the aging population and the biologic features of prostate cancer. However, the discrepancy between the age-adjusted mortality and the number of deaths from prostate cancer seems to continue in Japan, where cancer cases with local infiltration or distant metastasis still account for a substantial 35%, unlike in the US. Therefore, effective measures including screening are necessary.

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