

A Comparative Study of Mass Screening Findings for Prostate Cancer between Changchun in China and Natori in Japan^{*}

Hongliang Wang¹, Ling Zhang², Chunxi Wang¹, Haifeng Zhang¹, Ning Xu¹, Guoyi Ji², Xiaomeng Li²,
Hongwen Gao², Xuejian Zhao^{**2}

Abstract: Objective A mass screening in China's Changchun City and Japan's Natori City was conducted respectively with a view to making a comparison of the incidence status and clinic condition of prostate cancer between the two cities concerned. **Methods** 3566 Chinese and 2212 Japanese men older than 55 years old were mass checked by PSA-based screening, and those whose serum PSA elevated 4.0 ng/ml also underwent ultrasound-guided sextant prostatic biopsies. **Results** (1) In Changchun City, the PSA-positive rates (PSA 4.0 ng/mL or more) was 5.2% (185 in 3566), a little lower than 8.5% (189 in 2212) in Natori City. (2) Cancer detection rate in the screened persons in Changchun was 0.8% (28 in 3566), much lower than 2.1% (46 of 2212) in Natori. (3) The cancer detection rate by prostate biopsy was 25.2% (28 of 111) in Changchun and 26.9% (46 of 171) in Natori. (4) The number and percentage of cases of clinical stage II and III+IV were 17 (61%) and 11 (39%) in Changchun and 30 (65%) and 16 (35%) in Natori. (5) Seen in terms of the histologic grading, the rate of poorly and middle differentiated cancer was higher in Changchun (89%), while the percentage of well and middle differentiated cancer was higher in Natori (76.5%). **Conclusion** (1) Mass screening for prostate cancer is the best approach to early diagnosis and treatment of prostate cancer. (2) The analysis of the results suggests that the prostate cancer incidence and prevalence in Changchun, China are lower than those in Natori, Japan. (3) The histologic grade percentage of poorly differentiated cancer in Changchun is higher than that in Natori.

Key words: prostate-specific antigen (PSA); prostate cancer; clinical stage; histologic grading

In recent years, the incidence of prostate cancer increased rapidly in Asian countries. Nakagawa in Japan mentioned that the death rate from 83 people/year in 1950 grew to 6009 people/year in 1996, with a 70-fold increase^[1]. The case in China is much similar. According to the clinical epidemiological study of the Cancer Institute of Shanghai, the incidence rate of prostate cancer in China also grew from 0.48/100,000 males in the 1960's to 2.41/100,000 males in the 1990's^[2]. A careful examination we have made of the Clinical data of eight hospitals in Changchun City also indicates that the annual average incidence of prostate cancer from 1999 to 2001 is 4.72 times greater than that from 1986 to 1989^[3].

As is known to all, Japanese men are ethnically and racially similar to Chinese men. It thus follows that the biomedical parameters of prostate cancer is also similar. And so is the natural history of prostate cancer. The purpose of the present research is to explore and compare the difference of diagnosis results of mass screening for

^{*} Supported by the Japan International Cooperation Agency (JICA) and the Ministry of Science and Technology of China (2004DFB02000). The authors are grateful for the guidance from Professor KUWAHARA Masaaki (Miyagi Cancer Center, Japan).

^{**} Corresponding to Xuejian Zhao (1939.1-), female, MD, chief of Prostate Diseases Prevention and Treatment Research Center, Department of Pathophysiology, College of Basic Medicine, Jilin University; Main research field: procreated pathophysiology.

¹ Department of Urology, Jilin University First Hospital, Changchun, Postcode: 130041;

² Prostate Diseases Prevention and Treatment Research Center, Jilin University, Changchun, Postcode: 130021.

prostate cancer between Chinese men and Japanese men by using serum PSA determination.

METHODS

1. Data source

3566 Chinese men and 2212 Japanese men older than 55 years old were mass checked by PSA based screening (serum PSA cutoff value 4.0 ng/mL). In Changchun, the mass-screening program was conducted in men from companies or government institutions in its urban area. The information about the mass screening was given to the subjects by their own companies or institutions. In Natori, the mass screening was conducted in urban citizens, and the information was distributed from the Civil Welfare Center by mail.

2. Determination of serum PSA concentration

The commercial test kit CanAg (Diagnostic, Gothenburg, Sweden) and Tandem-R PSA (Beckman-Coulter, San Diego, Calif) were used in Changchun and Natori respectively for the PSA assays. The correlation coefficient (R) between the two PSA kits was 0.960 and the regression line was $y=1.03x + 0.096$ (y =PSA measured by Tandem-R PSA kit and x =PSA measured by CanAg kits). Since the correlation is strong and the value in the tested range is almost the same, PSA values in the two kits can be treated in much the same way.

3. Secondary examination

If the man had a PSA concentration greater than 4.0 ng/ml, the transrectal ultrasound-guided systematic sextant biopsy examination would be conducted by the doctors^[4].

Clinical stage and pathological stage: The patients of prostate cancer were staged in stage TNM system. Gleason grading system used for grading prostate cancer was divided into five grade categories and ten scores. The prostate cancer was divided into three kinds: well-differentiated (Gleason scores in the range of 2, 3, and 4), moderately differentiated (Gleason scores in the range of 5, 6, and 7), and poorly differentiated (Gleason scores in the range of 8, 9, and 10).

4. Statistical analysis

Data was indicated by average \pm standard deviation, groups were compared by T-test and Chi-square test. Statistics were calculated by using SPSS 10.0 (SPSS, Chicago, USA) and EXCEL 2000.

RESULTS

1. Comparative statistical analysis for PSA screening

The PSA-positive rate was 5.2% in Changchun, lower than 8.5% in Natori. The difference was statistically significant ($p<0.001$). The cancer detection rate by prostate biopsy was 25.2% in Changchun and 26.9% in Natori. After secondary examination rate was adjusted, the cancer detect rate reached to 1.3% in Changchun, which is still lower than 2.3% in Natori. The difference was statistically significant ($p<0.001$). Results of mass screening in Changchun and Natori are showed in Table 1.

2. Comparative statistical analysis for clinical stage

The clinical stage of the prostate cancer is shown in Table 2. The number (percentage) of cases of Clinical Stage II and III+IV were 17 (61%) and 11 (39%) in Changchun and 30 (65%) and 16 (35%) in Natori. The clinical stages of the prostate cancer detected by the mass screening were similar in the two cities.

3. Comparative statistical analysis for histologic grade

The histologic grade of the prostate cancer in the biopsy specimens is shown in Table 3. The percentage of

moderately differentiated cancer and poorly differentiated cancer was 89% in Changchun, but that of well differentiated cancer and moderately differentiated cancer was 76% in Natori. There was a significant difference between them ($p < 0.05$).

DISCUSSION

Prostate cancer, common in older men, is the second leading cause for cancer death in the United States^[4]. Recent data indicate that the incidence and mortality rates of prostate cancer in Japan have gradually increased^[1, 5]. With the aged men increasing and the diet changing, the incidence of prostate cancer increased rapidly in China and became the serious disease intimidating the aged men^[3, 6, 7].

According to the epidemiological analytic study of Hsing, age-adjusted incidence rates vary from country to country. North America was on the top, with an age-standardization incidence of 116/100000 in men, the second on the top was Canada and Sweden, and China and Japan was relatively lower, with an incidence of 2.4/100000 and 3.9/100000 respectively^[8]. According to a recent comparative study of serum PSA levels between Japanese-American and native Japanese men aged 75 years old, the cancer prevalence rate was described as 10.0% and 5.4%, respectively^[9]. The differences in incidence between Japanese Americans in the United States and Japanese in Japan are thought to be affected not only by genetic factors, but also by environment, e.g. life style, dieting habit and geographical difference. In view of this, comparison of the results of mass screening for prostate cancer in Chinese men and Japanese is also of great significance.

With the introduction and application of PSA testing, more and more prostate cancer patients are diagnosed and found in U.S.

The Japanese Nakagawa argued that in Japan since 1987, the use of PSA is of great help for early detection of prostate cancer^[1]. It has been shown that the use of PSA can help to diagnose prostate cancer at its early stage. Sensitivity of 39% and specificity of 96% in elevated PSA range were observed. The cancer detection rate in PSA-screened men in Changchun and Natori were 0.8% and 2.1% ($p < 0.0001$), respectively, the former being sharply lower than the latter.

The cancer detection rate by biopsy was not significantly different statistically (26.9% versus 25.2%), which shows that PSA is a stable marker of prostate cancer screening. But according to this data, the biopsy rate in the PSA-positive men was apparently lower in Changchun than in Natori (60.0% versus 90.5%, $p < 0.001$). The reason for this is that being the first of its kind in Changchun, this mass screening did not attract enough attention from the older men here, who lack health consciousness. Thus, we should promote the significance of mass screening in the future.

The adjusted rate was 1.3% and 2.3% ($p < 0.01$), respectively, which shows that in China prostate cancer detection rate is still lower than that in Japan though it reveals an increasing trend. The reason may be that the Chinese people have a different dieting habit and that mass screening has not been conducted widely so far in the country.

By using data from clinical cases, Zhao *et al*^[10] compared the clinical stage and pathological stage between Japanese group and Chinese group in 1990. The study shows that stage B and C were 79.3% and the moderately-differentiated cases takes up 61.3% in the Chinese group; Stage D were 52.0% and the poorly-differentiated prostate cancer cases are 51.1% in the Japanese group. The data for the present research come from prostate cancer screening. The clinical stages were similar in the two cities. The percentages of cases of Clinical Stage II were 61% and 65% in Changchun and in Natori, respectively, and Stage III+IV were 35% and

39% in the two cities. The percentage of moderately differentiated cancer and poorly differentiated cancer was 89% in Changchun, while the percentage of well differentiated cancer and moderately differentiated cancer was 76% in Natori. It can be inferred from this that the malignancy level in China is higher than that in Japan. It is also worthwhile to mention that our finding is different from the study conducted by Zhao *et al.* The difference is that we applied PSA screening to the diagnosis of prostate cancer at its early stage. Our study helps to prove that PSA mass screening is inevitable to the detection of the curable prostate cancer at its early stage.

REFERENCES

1. Nakagawa S, Kuroseki T. In: Cancer statistics incidence/mortality/prognosis, 1993. Tokyo: Shinohara Publishing Co. 1993, 171-185.
2. Deng J, Gao JT, Xie T, et al. Clinical epidemiological study on prostate cancer (Chinese). *Tumor*. 1995, 15(4): 340-342.
3. Zhang L, Ji GY, Li XM, et al. The influence of the mass screening for prostate cancer on the factors of clinical prostate cancer. *Chin J urology*. 2004, 25(2): 103-105.
4. Oliver SE, Gunnell D, Donovan JL, et al. Comparison of trends in prostate-cancer mortality in England and Wales and the USA. *Lancet*. 2000, 355(9217): 1788-1789.
5. The Research Group for Population-based Cancer Registration in Japan. Cancer incidence and incidence rates in Japan in 1995: estimates based on data from nine population-based cancer registries. *Jpn J Clin Oncol*. 2000, 30(7): 318-321.
6. Li XM, Tsuji I, Kuwahara M, et al. Mass screening of prostate cancer in Changchun City of China. *International Urology and Nephrology*. 2004, 36(4): 541-548.
7. Zhang HF, Wang HL, Xu N, et al. Mass screening of 12027 elderly men for prostate carcinoma by measuring serum prostate specific antigen. *Chin Med J*. 2004, 117(1): 67-70.
8. Hsing AW, Tsao L, Devesa SS. International trends and patterns of prostate cancer incidence and mortality. *Int J cancer*. 2000, 85(1): 60-67.
9. Shibata A, Whittemore AS, Imai K, et al. Serum levels of prostate-specific antigen among Japanese-American and native Japanese men. *J Natl Cancer Inst*. 1997, 89(22): 1716-1720.
10. Zhao LS, Yamiya L, Miwura W, et al. The comparative study of clinical stage and pathological stage for prostate cancer between Chinese and Japanese. *Chin J pathology*. 1990, 19(1): 35-36.

(Edited by Jane Chen)

Table 1 Results of mass screening in Changchun and Natori

	Changchun	Natori
Men who received PSA screening (n)	3566	2212
Men with PSA positive (n)	185	189
PSA-positive rate (%)	5.2 (185/3566)	8.5** (189/2212)
Men undergoing biopsy (n)	111	171
Biopsy rate for positive screening (%)	60.0 (111/185)	90.5** (171/189)
Men with cancer detected (n)	28	46
cancer detection rate by prostate biopsy (n)	25.2 (28/111)	26.9 (46/171)
Cancer detection rate for total PSA screening (%)	0.8 (28/3566)	2.1* (4.6/2212)

注 : * $p < 0.01$; ** $p < 0.001$

Table 2 Comparison of the clinical stage of the prostate cancer between two cities (%)

Group	Clinical Stage		Sum
	Stage II	Stage III+IV	
Changchun	17 (61)	11 (39)	28
Natori	30 (65)	16 (35)	46

Table 3 Comparison of the histologic grade of the prostate cancer between the two cities (%)

Group	Histologic Grade			Sum
	Well differentiated cancer	moderately differentiated cancer	poorly differentiated cancer	
Changchun	3 (11)	11 (39)	14 (50)	28
Natori	14 (30)	21 (46)	11 (24)	46