Osteopenia/Osteoporosis

from pelvic irradiation in premenopausal cervical cancer at Mahavajiralongkorn Thanyaburi Hospital

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Abstract

Backgrounds: In premenopausal women who received radiotherapy at pelvic region for cervical cancer that induced early post menopause. This led to develop osteopenia and/or osteoporosis as the same as postmenopausal women. This retrospective study is conducted to demonstrated incidence of osteopenia and/or osteoporosis after pelvic irradiation in premenopausal cervical cancer.

Material and method: Retrospective, descriptive study of premenopausal cervical cancer who received radiotherapy at pelvic region at Mahavajiralongkorn Thanyaburi Hospital since 1 October 2007 to 30 September 2012.

Results: The total premenopausal cervical cancer were163 patients, median age were 43.23 + 4.68 (28.4 - 52.1) years old and median BMI was 24.65 + 4.49 (15.79 – 41.65) kg/m2. They received radiotherapy with four fields box technique (57.67%), intracavitary high dose rate brachytherapy (98.77%) and without chemotherapy treatment (61.97%). There was no history of previous bone fracture (95.09%) and the most of patients had no previous hysterectomy (90.18%) and no previous oophorectomy (98.77%). After follow-up, the incidence of osteopenia and osteoporosis were 22.70% and 6.13%, respectively. The factor which affected of osteopenia and osteoporosis in this study were history of coffee or tea drinking ($p = 0.028$), exercise ($p = 0.010$) and history of bone fracture ($p = 0.034$).

Conclusion: At Mahavajiralongkorn Thanyaburi Hospital, radiotherapy at pelvic region in premenopausal cervical cancer induced osteopenia/osteoporosis higher than normal Thai female population. The factors which affected in this study included history of coffee or tea drinking, exercise and history of bone fracture.

Keywords: cervical cancer, osteopenia, osteoporosis, premenopausal, radiotherapy

บทคัดย่อ

ในผู้ป่วยหญิงวัยเจริญพันธุ์ที่เป็นโรคมะเร็งปากมดลูกที่ได้รับการรักษาด้วยการฉายรังสีบริเวณอุ้งเชิงกราน มีโอกาสเกิดการทำลายของเนื้อเยื่อกระดูกบริเวณอุ้งเชิงกรานและเกิดภาวะหมดประจำเดือน ทำให้ผู้ป่วยเสี่ยงต่อการเกิดโรคกระดูกพรุนเพิ่มขึ้นเช่นเดียวกับในผู้หญิงปกติที่อยู่ในภาวะหมดประจำเดือน ซึ่งโรคกระดูกพรุนเป็นปัญหาสาธารณสุขและเป็นภัยเงียบที่คุกคามสุขภาพและคุณภาพชีวิตของผู้ป่วย ดังนั้นการศึกษาวิจัยนี้เพื่อศึกษาภาวะการเกิดโรคกระดูกบาง/กระดูกพรุนในผู้ป่วยหญิงโรคมะเร็งปากมดลูกที่อยู่ในวัยก่อนหมดประจำเดือนที่ได้รับการรักษาด้วยการฉายรังสีบริเวณอุ้งเชิงกราน

วิธีการศึกษา เป็นการศึกษาวิจัยย้อนหลังเชิงพรรณนาในผู้ป่วยหญิงโรคมะเร็งปากมดลูก ที่อยู่ในวัยก่อนหมดประจำเดือน ที่ได้รับการรักษาด้วยการฉายรังสีบริเวณอุ้งเชิงกราน และไม่มีโรคประจำตัวเกี่ยวกับโรคทางกระดูกและไม่มีภาวะของโรคมะเร็งที่แพร่กระจายไปกระดูก โดยผู้ป่วยต้องได้รับการฉายรังสีที่โรงพยาบาลมหาวชิราลงกรณ ธัญบุรี ตั้งแต่ เดือนตุลาคม 2550 – กันยายน 2555 และมีผลการตรวจวัดความหนาแน่นของกระดูก

ผลการศึกษา ผู้ป่วยทั้งหมด 163 คน มีอายุเฉลี่ย 43.23 ± 4.68 ปี (28.4 - 52.1) ดัชนีมวลกาย เฉลี่ย 24.65 ± 4.49 กิโลกรัมต่อตารางเมตร (15.79 – 41.65) ได้รับการฉายรังสีด้วยเครื่องเร่งอนุภาคพลังงานโดยใช้ Four field box technique (ร้อยละ 57.67) ร่วมกับได้รับการใส่แร่ (ร้อยละ 98.77) และไม่ได้รับเคมีบำบัด (ร้อยละ 61.97) ผู้ป่วยส่วนใหญ่ไม่เคยมีประวัติกระดูกหักมาก่อน (ร้อยละ95.09) ไม่เคยผ่าตัดมดลูก (ร้อยละ90.18) ไม่เคยผ่าตัดรังไข่ (ร้อยละ 98.77) หลังการตรวจติดตามผู้ป่วยและส่งตรวจ BMD หลังจากได้รับการรักษาด้วยการฉายรังสีแล้ว พบว่ามีโอกาสเกิดภาวะกระดูกบางและกระดูกพรุน ร้อยละ 21.62 และ 5.95 ตามลำดับ ปัจจัยที่มีผลต่อการเกิดภาวะกระดูกบางและ/หรือกระดูกพรุน ได้แก่ พฤติกรรมการดื่มชาและ/หรือกาแฟ (p = 0.028) พฤติกรรมการออกกำลังกาย (p = 0.010) และ ประวัติการมีกระดูกหักมาก่อนการรักษา (p = 0.034)

สรุป ที่โรงพยาบาลมหาวชิราลงกรณ ธัญบุรีผู้ป่วยหญิงโรคมะเร็งปากมดลูก ที่อยู่ในวัยก่อนหมดประจำเดือน ที่ได้รับการรักษาด้วยการฉายรังสีบริเวณอุ้งเชิงกรานมีภาวะกระดูกบาง/กระดูกพรุนสูงกว่าผู้หญิงไทยปกติ และพบว่า ปัจจัยที่มีผลต่อการเกิดภาวะกระดูกบางและ/หรือกระดูกพรุนในการศึกษานี้ ได้แก่ พฤติกรรมการดื่มชาและ/หรือกาแฟ, พฤติกรรมการออกกำลังกาย และ ประวัติการมีกระดูกหักมาก่อนการรักษา

Introduction

As more people with cancer had survived longer and increasing number of patients are living with the complications of radiotherapy. Radiotherapy (RT) at pelvic region induces some side effect such as diarrhea, bladder problem, damage to surrounding non-cancerous tissues including pelvic bone and proximal femur. Women who received RT in the pelvic area may stop having menstrual periods and have other symptoms of menopause. [1, 2] There was a direct relationship between the lack of estrogen after menopause and the development of osteoporosis. Early menopause women have low estrogen hormone levels that cause bone resorption overtakes the building of new bone. Osteoporosis is one of the major problem because the morbid event is fracture. Following a hip fracture, there is 10-20% mortality over the subsequent 6 months, 50% of suffers will be unable to walk without assistance, and 25% will require long-term domiciliary care and high annual cost of osteoporosis to the healthcare system. [3] This retrospective study is conducted to demonstrate the incidence of osteopenia/osteoporosis that occurred after RT at pelvic region in premenopausal cervical cancer

Material and Method

We searched the archives of premenopausal cervical cancer patients who received RT at pelvic region in Mahavajiralongkorn Thanyaburi Hospital since 1 October 2007 to 30 September 2012. All patients were followed up to September 2013. The following data were collected: age, body weight, height, education, occupation, primary tumor, staging, radiotherapy technique, chemotherapy treatment and personal history which could be the factors that affected this study. We excluded patients who had underlying rheumatologic disorder such as rheumatoid arthritis, ankylosing spondylitis, bone metastasis, no bone densitometer study post radiotherapy and patients who refused study.

Data were analyzed using SPSS statistical software, version 15 (SPSS Inc., Chicago, IL). Descriptive statistic was summarized as number and percentage. Chi-square test and Fisher exact were used to correlate between each factor and bone densitometry. A two-sided p-value of <0.05 was considered statistically significant.

Results

The study revealed 667 cervical cancer patients who received RT at pelvic region in Mahavajiralongkorn Thanyaburi Hospital since 1 October 2007 to 30 September 2012. Of these, 337 patients were premenopausal without underlying rheumatologic disorder such as Rheumatoid arthritis, ankylosing spondylitis, bone metastasis. One hundred and sixty-three patients who had post-radiotherapy bone densitometer studies at lumbar spine were included in this study.

In 163 patients, mean age was 43.23 ± 4.68 (28.4 - 52.1) years old and mean BMI was 24.65 ± 4.49 (15.79 – 41.65) kg/m2. The most were stage IIB (86 patients, 52.76%), received RT with four fields box technique (94 patients, 57.67%), intracavitary high dose rate brachytherapy (161 patients, 98.77%) and without chemotherapy treatment (101 patients, 61.97%). There were no smoking (153 patients, 93.87%), no alcohol drinking (145 patients, 88.96%), no coffee or tea drinking (132 patients, 80.98%), no exercise (123 patients, 75.46%) and no history of previous bone fracture (155 patients, 95.09%). Almost had no previous hysterectomy (147 patients, 90.18%) and no previous oophorectomy (161 patients, 98.77%). Most of them did not take vitamin D (155 patients, 95.09%) but took calcium usually (119 patients, 73.01%). Characteristics of patients at baseline are showed in table 1 and the risk factors for osteoporosis in this study population are showed in table 2.

Premenopausal cervical cancer patients developed osteopenia and osteoporosis in 22.70% and 6.13%, respectively. Most of the patients underwent bone densitometry study post pelvic radiotherapy within 12-36 months (median 13.1 months, mean 20.3 months), the results are showed in table 3. The factors which affected of osteopenia and osteoporosis included history of coffee or tea drinking (p = 0.028), exercise (p = 0.010) and history of bone fracture (p = 0.034) (table 4).

Discussion

Limpaphayom did a Nation-wide survey during 2000-2001[4] and showed the age-adjusted prevalence of osteoporosis in Thai women ranging in age from 40-80 years was 13.6% and 19.8% for femoral neck and lumbar spine, respectively. The age-specific prevalence increased with age from 0.4%-1.7% at age 40-44 years, to more than 50% after 70 years of age. Comparatively, our study revealed premenopausal cervical cancer patients who underwent RT at pelvis region developed osteopenia (22.70%) and osteoporosis (6.13%) more than normal Thai women

Table 1 Patient's baseline characteristic (N = 163)

Characteristic	Number (%)	Mean (SD)
Age (year olds)		43.23 (4.68)
20 – 29.9	1 (0.61)	
30 – 39.9	36 (22.09)	
40 – 49.9	114 (69.94)	
50 – 55	12 (7.36)	
BMI (kg/m^2)		24.65 (4.49)
< 18.5	6 (3.68)	
18.5 – 22.9	64 (39.26)	
23 – 24.9	25 (15.34)	
25 – 29.9	54 (33.13)	
> 30	14 (8.59)	
Education		
No	3 (1.84)	
Primary school	93 (57.06)	
High school	51 (31.29)	
Diploma degree	4 (2.45)	
Bachelor degree	6 (3.68)	
Unknown	6 (3.68)	
Status		
Single	9 (5.52)	
Marry	127 (77.92)	
Widow	9 (5.52)	
Divorce	13 (7.98)	
Separated	4 (2.45)	
Unknown	1 (0.61)	
Career		
Not working	19 (11.66)	
Employee	89 (54.60)	
Agriculture	12 (7.36)	
Government service	4 (2.45)	
Merchant	26 (15.95)	
Other	13 (7.98)	

Characteristic	Number (%)	Mean (SD)
Stage		
Stage I	24 (14.72)	
Stage IIA	5 (3.07)	
Stage IIB	86 (52.76)	
Stage IIIA	0	
Stage IIIB	41 (25.15)	
Stage IV	5 (3.07)	
Unknown	2 (1.23)	
Radiotherapy technique		
AP//PA technique	69 (42.33)	
Four field box technique	94 (57.67)	
High dose rate brachytherapy		
Yes	161 (98.77)	
No	2 (1.23)	
Chemotherapy		
Concurrent chemotherapy	61 (37.42)	
Adjuvant chemotherapy	1 (0.61)	
No	101 (61.97)	

Table 2 Risk factors for osteoporosis

Factors	Number (%)
Underlying disease	
No	135 (82.82)
DM	2 (1.23)
Heart disease	1 (0.61)
HT	5 (3.07)
Thyroid	2 (1.23)
Renal disease	0
Other	18 (11.04)
Smoking	
Yes	10 (6.13)
No	153 (93.87)

Factors	Number (%)
Alcohol intake	
Yes	18 (11.04)
No	145 (88.96)
Coffee/Tea drinking	
Yes	31 (19.02)
No	132 (80.98)
Exercise	
Yes	40 (24.54)
No	123 (75.46)
Others drug intake	
Herb	13 (7.98)
Hormone	12 (7.36)

Factors	Number (%)
No	138 (84.66)
S/P Hysterectomy	
Yes	16 (9.82)
No	147 (90.18)
S/P Oophorectomy	
Unilateral	2 (1.23)
Bilateral	0
No	161 (98.77)
History of bone fracture	
Hip fracture	1 (0.61)
Wrist fracture	2 (1.23)
Arm fracture	3 (1.84)
Other sites	2 (1.23)
No	155 (95.09)
Calcium intake	
Yes	119 (73.01)
No	44 (26.99)
Vitamin D intake	
Yes	8 (4.91)
No	155 (95.09)

Table 3 Results of BMD and duration of BMD study after pelvic radiotherapy

Factor	Number (%)
Result of BMD	
Normal (BMD > -1)	116 (71.17)
Osteopenia (BMD -1 to -2.5)	37 (22.70)
Osteoporosis (BMD < -2.5)	10 (6.13)
Duration of BMD study after pelvic radiotherapy	
12 – 24 months	110 (67.48)
> 24 – 36 months	17 (10.43)
> 36 – 48 months	19 (11.66)
> 48 – 60 months	12 (7.36)
> 60 months	5 (3.07)

population. Some patients developed osteopenia from age over 30 years old and developed osteoporosis from age over 40 years old. Overall of patients who underwent bone densitometer study at lumbar spine had developed osteopenia/ osteoporosis within 12-24 months post RT. Incidence of osteopenia was 4.90%, 15.95% and 1.84% respectively, in the age group 30-39.9 years, 40-49.9 years and 50-55 years, respectively. An incidence of osteoporosis was 4.90% and 1.23% respectively, in the age group 40-49.9 years and 50-55 years, respectively. Another study from Pongchaiyakul C at Khon Kaen province[5] reported the prevalence of osteoporosis in pre-menopausal Thai women showing a bit higher than the aforementioned study. The prevalence of osteoporosis was found to be 37.4% at femoral neck, 30.2% at lumbar spine, 44.5% at ultra-distal radius and 31.5% at mid shaft-radius.

While the prevalence of osteoporosis in China base on 26 studies published between 1980 and 2008[6] showed the prevalence in Chinese premenopausal women (1.8–3.2%) was much lower than that in postmenopausal women (9.4% to 37.9%). And the prevalence of osteoporosis was much lower among those aged 40–50 years old than that among aged 50 years and older, by approximately 20 - 40 times. From the cross sectional study of osteoporosis among India women who underwent calcaneal Quantitative Ultra Sonography (QUS) method utilizing same WHO T score criteria for screening of osteopenia and osteoporosis.[7] This study revealed prevalence of premenopausal women developed osteopenia and osteoporosis were 38% and 7.7%, respectively. The prevalence of osteopenia was 42.7% and 64.3% respectively, in the age group 35-44 years and 45-54 years, respectively. And the prevalence of osteoporosis was 8.3% and 19% respectively, in the age group 35-44 years and 45-54 years, respectively.

Table 4 Correlation between factors and bone densitometry (BMD) report

Factors	BMD report			*p*- value
	Normal (n = 116)	Osteopenia (n=37)	Osteoporosis (n=10)	
Age (year olds)				0.349
20 – 29.9	1 (0.86%)	0 (0.0%)	0 (0.0%)	
30 – 39.9	28 (24.14%)	8 (21.62%)	0 (0.0%)	
40 – 49.9	80 (68.97%)	26 (70.27%)	8 (80.0%)	
50 – 55	7 (6.03%)	3 (8.11%)	2 (20.0%)	
BMI (kg/m^2)				0.167
< 18.5	5 (4.31%)	1 (2.70%)	0 (0.0%)	
18.5 – 22.9	39 (33.62%)	21 (56.76%)	4 (40.0%)	
23 – 24.9	22 (18.97%)	3 (8.11%)	0 (0.0%)	
25 – 29.9	41 (35.34%)	8 (21.62%)	5 (50.0%)	
> 30	9 (7.76%)	4 (10.81%)	1 (10.0%)	
Career				0.834
Not working	16 (13.79%)	3 (8.11%)	0 (0.0%)	
Employee	63 (54.31%)	18 (48.65%)	8 (80.0%)	
Agriculture	7 (6.03%)	4 (10.81%)	1 (10.0%)	
Government service	4 (3.45%)	0 (0.0%)	0 (0.0%)	
Merchant	17 (14.66%)	8 (21.62%)	1 (10.0%)	
Other	9 (7.76%)	4 (10.81%)	0 (0.0%)	
Stage				0.089
Stage I	20 (17.24%)	2 (5.41%)	2 (20.0%)	
Stage IIA	3 (2.59%)	2 (5.41%)	0 (0.0%)	
Stage IIB	64 (55.17%)	19 (51.35%)	3 (30.0%)	
Stage IIIA	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Stage IIIB	25 (21.55%)	12 (32.43%)	4 (40.0%)	
Stage IV	4 (3.45%)	1 (2.70%)	0 (0.0%)	
Unknown	0 (0.0%)	1 (2.70%)	1 (10.0%)	
Radiotherapy technique				0.120
AP//PA technique	45 (38.79%)	21 (56.76%)	3 (30.0%)	
Four field box technique	71 (61.21%)	16 (43.24%)	7 (70.0%)	

Factors	BMD report			*p*- value
	Normal (n = 116)	Osteopenia (n=37)	Osteoporosis (n=10)	
High dose rate brachytherapy				0.495
Yes	115 (99.14%)	36 (97.30%)	10 (100%)	
No	1 (0.86%)	1 (2.70%)	0 (0.0%)	
Chemotherapy				1.000
Concurrent chemotherapy	43 (37.07%)	14 (37.84%)	4 (40.0%)	
Adjuvant chemotherapy	1 (0.86%)	0 (0.0%)	0 (0.0%)	
No	72 (62.07%)	23 (62.16%)	6 (60.0%)	
Underlying disease				0.796
Yes	21 (18.10%)	6 (16.22%)	1 (10.0%)	
No	95 (81.90%)	31 (83.78%)	9 (90.0%)	
Smoking				0.602
Yes	9 (7.76%)	1 (2.70%)	0 (0.0%)	
No	107 (92.24%)	36 (97.30%)	10 (100%)	
Alcohol intake				0.326
Yes	11 (9.48%)	5 (13.51%)	2 (20.0%)	
No	105 (90.52%)	32 (86.49%)	8 (80.0%)	
Coffee/Tea drinking				0.028
Yes	28 (24.14%)	3 (8.11%)	0 (0.0%)	
No	88 (75.86%)	34 (91.89%)	10 (100.0%)	
Exercise				0.010
Yes	36 (31.03%)	3 (8.11%)	1 (10.0%)	
No	80 (68.97%)	34 (91.89%)	9 (90.0%)	
Others drug intake				0.099
Herb	10 (8.62%)	3 (8.11%)	0 (0.0%)	
Hormone	7 (6.03%)	4 (10.81%)	1 (10.0%)	
No	99 (85.35%)	30 (81.08%)	9 (90.0%)	
S/P Hysterectomy				0.558
Yes	13 (11.21%)	3 (8.11%)	0 (0.0%)	
No	103 (88.79%)	34 (91.89%)	10 (100.0%)	

Factors	BMD report			*p*- value
	Normal (n = 116)	Osteopenia (n=37)	Osteoporosis (n=10)	
S/P Oophorectomy				0.101
Unilateral	1 (0.86%)	0 (0.0%)	1 (10.0%)	
Bilateral	0 (0.0%)	0 (0.0%)	0 (0.0%)	
No	115 (99.14%)	37 (100%)	9 (90.0%)	
History of bone fracture				0.034 *
Hip fracture	0 (0.0%)	1 (2.70%)	0 (0.0%)	
Wrist fracture	2 (1.73%)	0 (0.0%)	0 (0.0%)	
Arm fracture	1 (0.86%)	2 (5.41%)	0 (0.0%)	
Other sites	1 (0.86%)	0 (0.0%)	1 (10.0%)	
No	112 (96.55%)	34 (91.89%)	9 (90.0%)	
Calcium intake				0.075
Yes	79 (68.10%)	32 (86.49%)	8 (80.0%)	
No	37 (31.90%)	5 (13.51%)	2 (20.0%)	
Vitamin D intake				0.643
Yes	5 (4.31%)	3 (8.11%)	0 (0.0%)	
No	111 (95.69%)	34 (91.89%)	10 (100.0%)	
Duration of BMD study after pelvic radiotherapy				0.085
12 – 24 months	84 (72.41%)	23 (62.16%)	3 (30.0%)	
> 24 – 36 months	11 (9.48%)	5 (13.51%)	1 (10.0%)	
> 36 – 48 months	9 (7.76%)	6 (16.22%)	4 (40.0%)	
> 48 – 60 months	9 (7.76%)	1 (2.70%)	2 (20.0%)	
> 60 months	3 (2.59%)	2 (5.41%)	0 (0.0%)	

Women who received RT in the pelvic area lead to impaired uterine function and impaired ovarian function that may stop having menstrual periods and have other symptoms of menopause. Direct high dose radiation (>25 Gy) commonly leads to irreversible damage to both vasculature and muscular function of the uterus [8]. Irreversible ovarian failure is certain at delivery dose to both ovaries of 4 to 7 Gy in women older than 40 years. A dose >8 Gy causes permanent ovarian damage in patients older than 40 years. A dose >20 Gy causes permanent sterility in patients of any age, with disappearance of the primordial follicles. [9] The patients in our study received external beam RT dose 40-60 Gy and intracavitary high dose rate brachytherapy dose 0-26 Gy, and stopped having menstrual period after complete RT.

Bilateral oophorectomy at the time of hysterectomy for benign disease was commonly practiced to prevent the subsequent development of ovarian cancer. Observational study of bilateral oophorectomy versus ovarian conservation [10] showed that estrogen deficiency, resulting from premenopausal was associated with higher risks of osteoporosis. Woman who underwent oophorectomy had the greatest risk of bone resorption during the first few years after oophorectomy and bone resorption markers were highest in 3 years since oophorectomy. And the lowest lumbar bone mineral density was found in the women who underwent oophorectomy more than 3 years, that bone loss after oophorectomy were greater than that after natural menopause. Same as the review risks and benefits of elective oophorectomy for benign gynecologic disorder [11] that showed women who underwent oophorectomy before age 45 years old had an accepted risk factor for development of osteoporosis. In a study following 16 years after those women had undergone oophorectomy, 54% more osteoporotic fractures than women with intact ovaries was observed. But in our study showed that about 15% of the patients developed osteopenia and osteoporosis within the first few years after pelvic RT. We found only 2 patients who underwent unilateral oophorectomy and 1 patient developed osteoporosis.

Most premenopausal women with low BMD had an underlying disorder or medication exposure that has interfered with bone mass during adolescence. In a population study from Olmsted Country, Minnesota[12] , 90% of women aged 20-44 with osteoporotic fractures were found to have a secondary cause such as estrogen deficiency, inflammatory disease, collagen disorders, gastrointestinal disease and glucocorticoids and other medication exposures. Modifiable factors included disease predisposing to bone loss, menstrual factors and lifestyle factors. From the review factors related to variation in premenopausal bone mineral status [13] showed heredity and possibly age at menarche were unmodifiable risk factors and attention should therefore be directed to more amenable factors. While amenorrhea, low body weight, disordered eating and smoking were modifiable risk. Protective factors include a higher body weight especially due to increased muscularity, calcium supplementation and load-bearing exercise. Moderate intakes of alcohol and caffeine have no apparent effect on premenopausal bone. Vitamin D was not a factor for premenopausal women who received incidental sun exposure and consume fortified foods, but supplementation should be considered for other, especially during the winter months. The longitudinal Michigan Bone Health study (MBHS) [14] revealed risk factors for lower BMD at the lumbar spine includes history of any facture. Risk factors for greater bone loss included postmenopausal status and the reporting of a reproductive cancer. The major protective factor was additional body weight. Baseline age, calcium intake, smoking and current physical activity were not associated with bone loss. But the factors that affected osteopenia/ osteoporosis in our study were history of coffee or tea drinking, exercise and history of bone fracture.

Our study showed the patients who drink coffee/ tea (≥3 cup/ week) had lower incidence of osteopenia/ osteoporosis than the patients who not drink coffee/ tea (≤ 3 cup/ week). To date, it is well known that consumption of coffee may increase urinary excretion of calcium which may induce osteoporosis especially in people with inadequate calcium intake. Higdon JV [15] suggested that coffee consumption was significantly associated with increased risk of osteoporosis and osteoporotic fracture. However, Choi [16] evaluated the effects of coffee consumption on bone mineral

density in Korean premenopausal women. They obtained the data from the fourth Korea National Health and Nutrition Examination Survey 2008–2009, which consisted of 1,761 Korean premenopausal women. They found that coffee consumption showed no significant association with the bone mineral density of either the femoral neck or lumbar spine. These results were similar to findings from a large and long-term epidemiological study published in Sweden. [17] They obtained 61,433 women born in 1914–1948 and was followed up from 1987 through 2008. They showed a high coffee intake (≥4 cups daily) versus a low intake (<1 cup daily) was associated with a 2%–4% lower bone density but the odds ratio for osteoporosis was only 1.28 (95% confidence interval: 0.88, 1.87). Thus, high coffee consumption was associated with a small reduction in bone density.

Our study had limitation from being retrospective study. Many factors that affected our results such as no BMD study before radiotherapy treatment, follow-up time of BMD may not be longer enough to demonstrate the developing of osteopenia/ osteoporosis and there was the small number of the patients in our study. However, this study can be used as a guideline for developing appropriate monitoring and evaluation models for pelvic RT in premenopausal patient of our hospital in the future.

Conclusion

In our study, RT at pelvic region in premenopausal cervical cancer induced osteopenia/ osteoporosis higher than normal Thai female population. The factors which affected in this study included history of coffee or tea drinking, exercise and history of bone fracture.

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