(e) ISSN Online: 2321-9599

(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

A Study on Gastric Complications after AdjuvantRadiotherapy for Breast Cancer

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ABSTRACT:

Introduction: The impact of radiation on the stomach after adjuvant radiotherapy for breast cancer is, however, little understood. While the stomach is thought to be generally safe to irradiate, we hypothesised that a number of factors that increase the risk of gastric illness in the Indian population. **Materials and Methods:** patients who underwent curative surgery for breast cancer followed by adjuvant RT were identified. To secure ≥ 5 years of follow-up, the cohort who underwent RT in 2012 was selected and followed until 2016 for development of gastric complications. Right and left breast cancers were identified using breast cancer codes: right breast(C50.*0) and left breast(C50.*1). **Results:** Of all the patients, 13.8% (20/144) patients developed gastricsymptoms: 16 patients suffered grade I toxicity (loss ofappetite, nausea), 8 patients with grade II toxicity (lossof appetite, nausea, vomit, lose weight ≤ 5%), and 1 withgrade III toxicity (loss of appetite, nausea, vomit, lose weight ≥ 5%). **Conclusion:** Dose limitation in stomach should be considered when the radiotherapyplan was formulated, especially for the patients treated with hypofractionated radiotherapy.

Keywords: Radiotherapy, breast cancer, gastric illness.

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This article may be cited as: Behera SK. A Study on Gastric Complications after AdjuvantRadiotherapy for Breast Cancer. J Adv Med Dent Scie Res 2016;4(6):460-463.

INTRODUCTION

Patients with breast cancer are increasingly undergoing adjuvant radiation (RT) and breast-conserving surgery.1, 2 As a result, both doctors and patients are very interested in post-RT problems. Numerous studies have looked into late cardiac issues after adjuvant radiotherapy for the left breast, and a sizable population-based study found a linear correlation between heart dose and coronary heart disease.3. When making plans for whole breast radiation therapy, the ipsilateral lung and heart are typically the organs of concern. Nevertheless, depending on a person's unique structure, other healthy organs like the stomach, liver, and colon are also commonly exposed to radiation. Occasionally included in the tangential RT field for left breast cancer treatment, the stomach is situated right below the left diaphragm. The impact of radiation on the stomach after adjuvant radiotherapy for breast cancer is, however, little understood. While the stomach is thought to be generally safe to irradiate, we hypothesised that a number of factors that increase the risk of gastric illness in the Indian population could intensify the toxicities of radiation therapy on the stomach. This study's primary goal is to establish that there are stomach side effects after breast cancer radiation treatment, as these effects have not received much attention. By examining the patient's features, any associated primary causes that may be causing the negative effects may be identified. Radiation therapists can minimize the likelihood of side effects by using the suspected factors.

It is commonly recognized that radiation therapy to the upper abdomen is invariably linked to digestive disorders, including pancreatic, biliary tract, and stomach cancers.4 The upper abdominal OARs have been identified as the peripheral emesis trigger zone.5, 6 The neural vagal contractions, fibres gathered in the coeliac plexus, the gastroesophageal junction, and the gastric mouth—through which the afferent pathway of emesis to the brain stem develops—are located in this anatomical region. The stomach and left breast are situated very near to each other among the organs of the upper abdomen. The distance changes as the stomach's volume changes. Therefore, it's critical to understand how the stomach dose and the gastrointestinal symptoms in LSBCP are related.

MATERIALS AND METHODS

Describes the process of selecting the study population. After excluding women who were already diagnosed with other cancers prior to breast cancer and those aged < 20 years. patients who underwent curative surgery for breast cancer followed by adjuvant RT were identified. To secure ≥ 5 years of follow-up, the cohort who underwent RT in 2012 was selected and followed until 2016 for development of gastric complications. Right and left breast cancers were identified using breast cancer codes: right breast(C50.*0) and left breast(C50.*1). Cases with unknown tumor laterality and both right and left breast codes were excluded. Finally, a total of

3000patients were included in the analysis.
At the first outpatient visit, patients were asked to maintain a regular living habit and regular diet. Any chemotherapeutics couldn't be carried out during the treatment, especially oral capecitabine. Then the radiotherapy treat-ment was delivered at the same time of a day with the CT scan. All patients were treated with Axesse linear accel-erator (Elekta) with daily set-up according to the skinmarkers and cone-beam CT (CBCT) image registrationonceaweek.
After the end of the therapy, patients were asked a setof questions about toxicity information in the clinic vis-its. Questions usually included the incidence and severity of nausea, vomiting, bad appetite, diarrhoea, loss of weight, and other common side effects. The upper digestive toxicities were graded according to the systems pro-posed by RTOG.

STATISTICAL ANALYSIS

Student's t test was used to compare continuous variablesstatistically, and chi-square and Fisher's exact tests wereused for categorical variables. Statistical analyses wereperformed using SPSS 23.0 (SPSS IBM Inc., Armonk, New York). A p-value < 0.05 was considered statisticallysignificant.

RESULTS

Of all the patients, 13.8% (20/144) patients developed gastricsymptoms: 16 patients suffered grade I toxicity (loss ofappetite, nausea), 8 patients with grade II toxicity (lossof appetite, nausea, vomit, lose weight ≤ 5%), and 1 withgrade III toxicity (loss of appetite, nausea, vomit, lose weight ≥ 5%). Among the cases with or without gastric symptoms, it was found that there was no statistically significant difference between the two groups in age(P=0.369), T staging(P=0.684), N staging(P=0.281), hormone receptors(P = 0.357), human epidermal receptor-2(HER2) (P = 1.000), surgical methods(P = 0.587), fractionated regimen(P = 0.275), and chemotherapy conditions (P = 1.000). However, stomach volume(P=0.047) and the FB mode(FB/DIBH)(P=0.028) were associated with a statistically significantly greaterrisk for acute radiation toxicity (see Table 1).

	Gastric side effects No(%)	Yes (%)	χ^2-value/tvalue	P-value
Age			0.94	0.369
Tstage	48.2 ± 9.3	50.2 ± 11.4	1.53	0.684
T1	51(89.2)	9(13.2)		
T2	50(86.1)	10(14.3)		
T3	11(83.2)	4(21.3)		
T4	9(43.1)	0(0.0)		
Nstage			1.38	0.281
N0	53(85.1)	14(16.2)		
N1,N2,N3,Nx	66(93.2)	11(8.0)		
Hormonereceptor(±)	0.359			
Negative	30(85.1)	10(17.2)		
Positive	89(90.1)	15(11.2)		
HER2			0.05	1.000
Negative	80(89.1)	15(12.3)		
Positive	39(89.4)	10(13.1)		
Breastconservingsurgery(yes/no)			0.48	0.587
No	53(89.2)	13(15.1)		
Yes	66(90.2)	12(11.5)		
Fractionated regimen			1.49	0.276
Conventionalradiotherapy	52(93.1)	6(8.1)		
Hypofractionatedradiotherapy	67(85.7)	16(16.3)		
Chemotherapy(yes/no)			0.01	1.000
No	28(90.3)	8(13.2)		
Yes	91(89.2)	17(13.1)	3.01	0.049
Stomach volume(m^3)				

DISCUSSION

It is commonly known that radiation for upper abdominal tumours, such as pancreatic, gastric, or liver cancer, is typically linked to radiotherapy-induced gastrointestinal reactions.7. Vomiting can also occur with total body radiation. As we previously discussed, OARs were typically irradiated in the upper abdomen, which is the peripheral trigger zone of emesis, resulting in RINV. In breast radiotherapy, the OARs are typically not exposed to substantial radiation doses due to their deep abdominal position. This explains why the RINV in breast cancer was disregarded for a very long period. If

sufficient blocking is utilised, stomach doses can be greatly decreased for the majority of individuals. However, in patients with very large stomachs, the space created by the stomach compresses surrounding organs, pushing the left lung higher and resulting in a comparatively shorter distance between the stomach and left breast. Because of this, a sizable portion of our patients in our clinical practise have had grade I–II gastrointestinal toxicity ever since our centre implemented the hyper-fractionated radiation plan. Typically, RINV happened a few hours or right after breast radiation. Some patients experienced some degree of weight loss following radiation therapy.

The stomach's irradiation dose was linked in our study to acute radiation-related gastric complications. The risk of stomach problems increased considerably with higher Dmax/F, D60cc/F, D30cc/F, or D10cc/F. A significant percentage of the stomach was in the high-dose zone in the majority of individuals who experienced gastric poisoning. As shown, a greater stomach capacity is typically connected with a higher maximum dosage or a larger high-dose zone inthe stomach. Due to differences in stomach volumes, the dosimetric distribution throughout the stomach varies greatly. A higher stomach volume reduces the space between the stomach and the PTV by bringing the stomach wall and the chest wall closer together. Numerous studies have examined the dose-related benefits of breast cancer radiation therapy in DIBH mode for the heart, liver, lung, and lung.8–14 That being said, this is the first report to note the stomach dosage in both FB and DIBH. Ever since our centre implemented the DIBH approach, a significant fraction of LSBCP patients have undergone radiation in the novel respiratory gating mode. The incidence rate of gastrointestinal toxicity varied significantly across the DIBH and FB groups. Physiological factors may contribute to variations in the stomach dose. For example, with DIBH, the lungs expand and press the diaphragm downward, resulting in a longer distance between the stomach and PTV and a lower radiation dose than with FB. Consequently, favourable dose distribution in the stom-ach can be obtained in DIBH mode, lowering the likelihood of stomach discomfort.

Due to a high intake of spicy and salty foods and H. pylori infection, stomach cancer is on the rise in Korea. The crude incidence rates of stomach cancer in the female population of Korea are 0.04%, 0.09%, and 0.17% for the age groups of 40–54, 55–69, and 70–79 years, respectively.15 The incidence rates of gastric cancer in patients with breast cancer were 0.14% and 0.08% in the surgery-alone and surgery + RT groups, respectively, according to data from surveillance, epidemiology, and end results.16 According to a different Western study17, the incidence rates of stomach cancer in patients who underwent radiation therapy (RT) for breast cancer were 0.16% and 0.22%, respectively. Nonetheless, there was no difference in the incidence of patients with left and right breast tumours. There are various restrictions on this study. First, a number of significant confounding factors, including alcohol intake, smoking, and H. pylori infection, were overlooked in relation to stomach disease. Regretfully, hospital or personal data could not be connected to HIRA data. Second, because to problems with reimbursement or physician priorities, there are occasional purposeful or inadvertent inaccuracies in the claim data. Moreover, it is challenging to determine the precise relationship between radiotherapy (RT) and various diseases by comparing endoscopic findings with RT fields, particularly in cases of hemorrhagic gastric disease. We compared the two groups despite the potential for claim-related mistakes and other clinical characteristics, such as H. pylori infection, smoking history, and medication use, to be similar across right and left breast tumours. Lastly, there was no difference in the development of stomach cancer or hemorrhagic gastric disease between right and left breast malignancies, suggesting that RT does not raise the risk of these conditions further. However, as RT-related secondary malignancy typically occurs in about 10 years, crossing incidence curves of right and left breast malignancies for stomach cancer development at 10 years suggest that a longer follow-up time may be required.

CONCLUSION

A huge stomach could be closer to thebreast PTV, so large meals should be avoided beforetreatment. DIBH treatment should be implemented incentres where conditions are satisfied to reduce radio-therapysideeffects.Furthermore,doselimitationins tomach should be considered when the radiotherapyplan was formulated, especially for the patients treated with hypofractionated radiotherapy.

REFERENCES

1. Jung KW, Won YJ, Kong HJ, Lee ES; Community of Population-Based Regional Cancer Registries. CancerstatisticsinKorea:incidence,mortality,survival,and prevalencein2015.CancerResTreat2018;50:303-16.
2. Kang SY, Kim YS, Kim Z, Kim HY, Lee SK, Jung KW, et al. Basic findings regarding breast cancer in Koreain2015:datafromabreastcancerregistry.JBreastCancer2018;21:1-10.
3. DarbySC,EwertzM,McGaleP,BennetAM,Blom-GoldmanU,BrønnumD,etal.RiskofischemicheartdiseaseAmong

inwomenafterradiotherapyforbreastcancer.NEnglJMed 2013;368:987-98.
4. Kris MG, et al. American Society of Clinical Oncology guideline forantiemeticsinoncology:update2006.JClinOncol.2006;24(18):2 932–47.
5. GrayH.Anatomyofthehumanbody,13thAmerican.Philadelphia: Lea&Febiger;1985.p.367–70.
6. GuytonAC,etal.Textbookofmedicalphysiology.eleventh.Philad elphia:Elsevier; 2006. p. 823–4.
7. Kris MG, et al. American Society of Clinical Oncology guideline forantiemeticsinoncology:update2006.JClinOncol.2006;24(18):2 932–47.
8. LaiJ,etal.Meta-analysisofdeepinspirationbreathhold(DIBH)versusfree breathing (FB) in postoperative radiotherapy for left-side breastcancer.BreastCancer.2020;27(2):299–307.
9. Testolin A, et al. Deep inspiration breath-hold intensity modulatedradiation therapy in a large clinical series of 239 left-sided breast cancerpatients:adosimetricanalysisoforgansatriskdosesandclinica lfeasibil-ityfromasinglecenterexperience.BrJRadiol.2019;92(1101):20190 150.
10. RaficKM,etal.DosimetricandclinicaladvantagesofadaptingtheDIB Htechniquetohybridsolitarydynamicportalradiotherapyforleft-sidedchest-wallplusregionalnodalirradiation.MedDosim.2020;45(3):256–63.
11. Pandeli C, et al. Dose reduction to organs at risk with deep-inspirationbreath-holdduringrightbreastradiotherapy:atreatmentplanningstudy.R adiatOncol.2019;14(1):1–10.
12. Mast ME, et al. Left-sided breast cancer radiotherapy with and withoutbreath-hold:doesIMRTreducethecardiacdoseevenfurther?RadiotherO ncol.2013;108(2):248–53.
13. QuirkS,etal.Aretrospectiveanalysistodemonstrateachievabledo sim-etry for the left anterior descending artery in left-sided breast cancerpatientstreatedwithradiotherapy.RadiotherOncol.2020;1 48:167–73.
14. Nissen HD, et al. Improved heart, lung and target dose with deepinspirationbreathholdinalargeclinicalseriesofbreastcancer patients.RadiotherOncol.2013;106(1):28–32.
15. SongM,KangD,YangJJ,ChoiJY,SungH,LeeY,etal.Ageand sexinteractionsingastriccancerincidenceandmortalitytren dsinKorea.GastricCancer2015;18:580-9.
16. BerringtondeGonzalezA,CurtisRE,GilbertE,BergCD,S mithSA,StovallM,etal.Secondsolidcancersafterradiothe rapyforbreastcancerinSEERcancerregistries.BrJCancer 2010;102:220-6.
17. BurtLM,YingJ,PoppeMM,SunejaG,GaffneyDK.Riskof secondarymalignanciesafterradiationtherapyforbreastca ncer:comprehensiveresults.Breast2017;35:122-9.
18. KimJY,SongHS.Metachronousdoubleprimarycanceraft ertreatmentofbreastcancer.CancerResTreat2015;47:64-71.
19. JungHK,ParkS,KimNW,LeeJE,KimZ,HanSW,etal.Dev elopmentofsecondprimarycancerinIndianbreastcancers urvivors.AnnSurgTreatRes2017;93:287-92.