SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Rayamajhi *et al*., 2025
doi: 10.21276/SSR-IIJLS.2025.11.5.33

Original Article

open access

Response Evaluation of Locally Advanced Cervical Cancer with MRI Contrast Pelvis Post 3 Months of Treatment in a Tertiary Centre in Eastern Nepal

Asmita Rayamajhi[1*], Dhiraj Gupta[1], Mona Priyadarshini[2], Deepak Suman Jha[3], Sajjad Ahmed Khan[4], Gyanendra Man Singh Karki[5]

[1]Radiation Oncologist, Department of Clinical Oncology, Birat Medical College Teaching Hospital, Tankisinuwari, Nepal
[2]Obstetrics and Gynecologist, Department of Obstetrics and Gynecology, Birat Medical College Teaching Hospital, Tankisinuwari, Nepal
[3]Medical Physicist, Department of Clinical Oncology, Birat Medical College Teaching Hospital, Tankisinuwari, Nepal
[4]Intern, Department of Clinical Oncology, Birat Medical College Teaching Hospital, Tankisinuwari, Nepal
[5]Professor, Department of Obstetrics and Gynecology, Birat Medical College Teaching Hospital, Tankisinuwari, Nepal

***Address for Correspondence:** Dr. Asmita Rayamajhi, Department of Clinical Oncologist, Department of Clinical Oncology, Birat Medical College Teaching Hospital, Tankisinuwari-56613, Nepal
E-mail: asmita.7714@gmail.com

Received: 08 July 2025/ Revised: 04 Aug 2025/ Accepted: 30 Aug 2025

ABSTRACT

Background: Cervical cancer remains a leading cause of morbidity and mortality among women, ranking as the second most common cancer in the female population. For patients with locally advanced disease, the standard curative approach includes external beam radiotherapy with concurrent chemotherapy, followed by brachytherapy. Response evaluation is performed approximately three months after treatment completion, using imaging to compare results with baseline scans. Patients are subsequently categorised as having a complete response, stable disease, or progressive disease.

Methods: This longitudinal, prospective, observational study was conducted among patients with locally advanced cervical cancer. Pre-treatment imaging, primarily magnetic resonance imaging (MRI) of the abdomen and pelvis, was performed before the initiation of therapy. Post-treatment imaging was obtained approximately three months after completion of therapy to assess treatment response.

Results: A total of 81 patients were included in the study. Of these, 77.8% demonstrated a complete response at three months. Patients with stage IIB disease showed the highest complete response rate (94.5%). In contrast, patients with stage IVA disease exhibited a higher likelihood of residual or progressive disease.

Conclusions: Patients with earlier stages of locally advanced cervical cancer are more likely to achieve a complete response at three months. MRI remains a valuable modality for evaluating treatment response. However, cases with para-aortic nodal involvement or bladder and rectal invasion, despite curative intent, demonstrate poorer prognosis with increased risk of recurrence and systemic failure. Long-term follow-up is essential for these patients to monitor outcomes and guide further management.

Key-words: Cervical cancer, MRI pelvis, Locally advanced disease, Treatment response, Complete response

How to cite this article
Rayamajhi A, Gupta D, Priyadarshini M, Jha DS, Khan SA, et al.Response Evaluation of Locally Advanced Cervical Cancer with MRI Contrast Pelvis Post 3 Months of Treatment in a Tertiary Centre in Eastern Nepal. SSR Inst Int J Life Sci., 2025; 11(5): 8423-8430.

Access this article online
https://iijls.com/

INTRODUCTION

Cervical cancer is one of the leading cancers in the female population in Nepal. According to Globocan Nepal 2022 data, it comprises a total of 22,008 new cancer cases. Cervical cancer is the second most common cancer case, comprising 17.8% in total, with mortality around 8.9% [1]. Risk factors of cervical cancer include repeated infection with Human Papillomavirus infection, particularly with strains HPV16/18.

doi: 10.21276/SSR-IIJLS.2025.11.5.33

This resulted in the development of screening and preventive methods as well. In addition to this, smoking has also been associated with a risk factor for cervical cancer screening [2]. The staging of cervical cancer is done by the International Federation of Gynaecology and Obstetrics (FIGO). Stage revision was performed in 2018, which included a more distinct understanding of node involvement and stratified the 5-year Overall survival and progression-free survival [3]. The stage and progression of cervical cancer determine the treatment.

There are three treatment modalities: surgery, radiation therapy, and chemotherapy. Depending on the stages, these therapies and their combinations are chosen. Surgery is excluded from the option once the stage of the disease is locally advanced. Definitive radiation with 50Gy/25# with a combination of concurrent chemotherapy is usually the treatment of locally advanced cervical cancer stage IB2-IVA. However, there are some therapeutic limitations to treatment with concurrent chemoradiation, including lymph node enlargement, tumour diameter, pre-treatment haemoglobin level, and clinical stage [4-6]. The phase 3 interlaced trial, published in 2024, stated an improvement in overall survival and progression-free survival with induction chemotherapy consisting of 6 weekly cycles, followed by concurrent chemoradiation, compared to chemoradiation alone. There are different methods of imaging in cervical cancer, from staging to post-treatment follow-up. MRI (Magnetic Resonance Imaging, Contrast-enhanced (CT scan), and Positron-enhanced CT scan (PET scan). The use of follow-up scans should be rational, considering the cost factor and radiation exposure.

MRI is usually preferred for imaging follow-up purposes. The tumour presents an intermediate signal intensity (SI) on T2WI, a high signal intensity (SI) on DWI at high b-value, and a low SI on the apparent diffusion coefficient (ADC) map [6-9]. In cases of clinical residual disease, the use of PET-CT may be considered for assessing nodal involvement. MRI helps to localise relapse better than a CT scan, and PET-CT helps for distant and nodal spread, so the combination of MRI and PET-CT is considered for the diagnosis of relapse [10].

MATERIALS AND METHODS

Study Design and Setting- This was a hospital-based, prospective observational study conducted at Birat Medical College Teaching Hospital, Biratnagar, Nepal, from April 2024 to September 2024. Ethical approval was obtained from the Nepal Health Research Council (NHRC), Kathmandu, Nepal. The study aimed to assess treatment response in patients with locally advanced cervical cancer three months after completion of therapy using imaging modalities.

Study Population and Staging- All patients with histologically confirmed locally advanced cervical cancer according to FIGO 2018, who had baseline MRI and who received chemo radiation, and the first 3 months of follow-up after radiation were included in the study. Women with locally advanced cervical carcinoma (stage IIB-IVA) were included in the study.

Treatment Protocol- Patients received external beam radiotherapy (50 Gy in 25 fractions) with concurrent chemotherapy, followed by three fractions of intracavitary brachytherapy, as per institutional guidelines.

Response Evaluation- Treatment response was assessed using magnetic resonance imaging (MRI) of the abdomen and pelvis, performed at baseline and three months after completion of therapy. Imaging findings before and after treatment were compared, and tumour response was evaluated according to the Response Evaluation Criteria in Solid Tumours (RECIST 1.1).

- **Complete Response:** Disappearance of all target lesions.
- **Partial Response:** ≥30% decrease in the sum of the longest diameters of target lesions.
- **Progressive Disease:** ≥20% increase in the sum of the diameters from nadir or appearance of new lesions.
- **Stable Disease:** No significant shrinkage or growth qualifying for partial response or progression.

Additional Imaging Parameters- Alongside RECIST assessment, the following features were evaluated on pre- and post-treatment imaging:

- ✓ **Parametrial invasion-** Defined as disruption or thickening of the hypointense cervical stromal ring, or abnormal signal intensity extending into the parametrium on T2-weighted or diffusion-weighted MRI.

doi: 10.21276/SSR-IIJLS.2025.11.5.33

- ✓ **Lymph node involvement-** Considered positive if nodes measured >10 mm in short-axis diameter on MRI, showed restricted diffusion, or demonstrated increased metabolic uptake on PET-CT (when available).
- ✓ **Hydronephrosis-** Identified as dilatation of the renal pelvis and calyces secondary to ureteric obstruction, visualised on MRI or CT.
- ✓ **Bladder or rectal invasion-** Diagnosed when the fat plane between the uterus and bladder or rectum was obliterated.

Statistical Analysis- All imaging parameters were compared before and after treatment to determine response patterns. The findings were analysed descriptively to evaluate treatment outcomes across different stages of locally advanced cervical cancer.

RESULTS

Fig. 1 shows that the largest age group is 61-70 (purple), followed by the 51-60 age group (yellow). These two groups have significantly more patients than the other age ranges. The 41-50 (red) group is also fairly substantial, while the 31-40 (green) group is smaller, and the 20-30 (blue) group is the least represented.

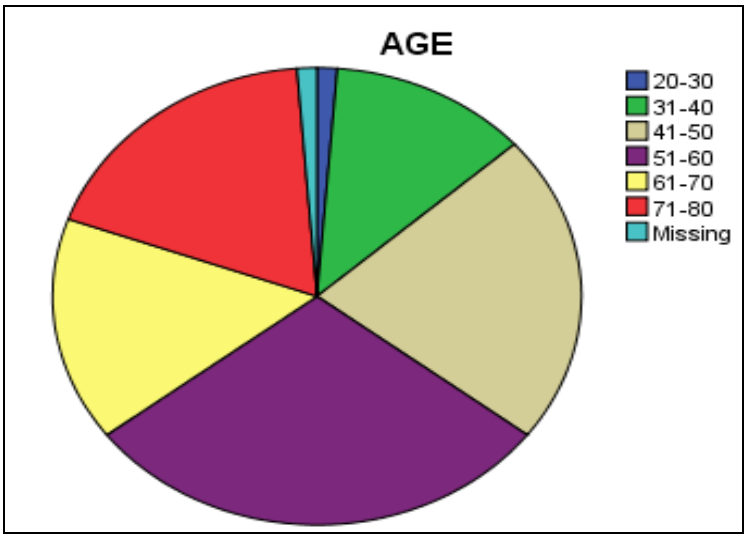

Fig 1: Age distribution of the patients

Table 1 shows the distribution of disease stages among 81 participants. The majority (45.7%) are in Stage IIB, followed by smaller groups in Stage IIIA (9.9%), IIIB (9.9%), and IIIC1 (12.3%). Fewer cases are found in Stage IIIC2 (4.9%) and Stage IVA (17.3%). The cumulative percentage shows a concentration of cases up to Stage IVA, encompassing all 81 participants.

Table 1: Stage Of Diseases

Stages	Frequency	Percent	Valid Percent	Cumulative Percent
Stage IIB	37	45.1	45.7	45.7
Stage IIIA	8	9.8	9.9	55.6
Stage IIIB	8	9.8	9.9	65.4
Stage IIIC1	10	12.2	12.3	77.8
Stage IIIC2	4	4.9	4.9	82.7
Stage IVA	14	17.1	17.3	100
Total	81	98.8	100	

doi: 10.21276/SSR-IIJLS.2025.11.5.33

Table 2 shows the relationship between smoking status and MRI response in a study. Among the 81 participants, most who quit smoking (57) experienced a complete response (5 out of 63). Smokers had more cases of progressive disease, while those who never smoked showed fewer partial responses. The "sometimes" smokers' group had minimal representation, with only one case.

Table 2: Findings of the smoking status and MRI response

MRI Response	Smoking Status			Total
	Yes	No	Sometimes	
Complete Response	5	57	1	63
Partial Response	2	0	0	2
Stable Disease	3	1	0	4
Progressive Disease	6	6	0	12
Total	14	66	1	81

Table 3 presents paired differences for various clinical measures before and after treatment, along with their statistical significance. The first pair, comparing the size in MRI/CT scans before and after treatment, shows a mean difference of 1.37 with a standard deviation of 0.58. The t-value of 21.27 and p-value of 0 indicate a highly significant difference, suggesting that the treatment had a notable impact on the size of the affected area. The second pair, which examines the number of nodes in the iliac region before and after treatment, has a mean difference of -1.17 and a standard deviation of 2.42. With a t-value of -4.34 and a p-value of 0, this change is also statistically significant, indicating a reduction in the number of nodes post-treatment. For the third pair, comparing pre- and post-treatment parametrial invasion, the mean difference is -0.90, with a standard deviation of 0.3. The t-value of -27.01 and the p-value of 0 signify a highly significant reduction in parametrial invasion following treatment. The fourth pair, analyzing hydronephrosis, shows a smaller mean difference of -0.13 with a standard deviation of 0.37. Despite the relatively smaller mean difference, the t-value of -3.22 and a p-value of 0.002 indicate that the reduction in hydronephrosis is statistically significant. The fifth pair, examining bladder invasion, reports a mean difference of -0.01 with a standard deviation of 0.19. The t-value of -0.57 and the p-value of 0.56 suggest that there is no significant change in bladder invasion after treatment. Lastly, the sixth pair, comparing rectal invasion before and after treatment, shows a mean difference of -0.03 with a standard deviation of 0.19. With a t-value of -1.75 and a p-value of 0.08, the reduction in rectal invasion is not statistically significant at the conventional 0.05 level.

Table 3: Paired Differences Analysis of Pre- and Post-Treatment Parameters

Pairs		Paired Differences		t	Sig. (2-tailed)
		Mean	Std. Deviation		
Pair 1	Size In MRI/Ct Scan Pre-treatment - Size in MRI/Ct Scan Post Treatment	1.37	0.58	21.27	0
Pair 2	Number Of Nodes in Iliac Region Pre-treatment - Number of Nodes in Iliac Region Post Treatment	-1.17	2.428	-4.34	0
Pair 3	Pre-treatment Parametrial Invasion - Post-treatment Parametrial Invasion	-0.90	0.3	-27.01	0
Pair 4	Pre-treatment Hydronephrosis - Post-treatment Hydronephrosis	-0.13	0.379	-3.22	0.002

doi: 10.21276/SSR-IIJLS.2025.11.5.33

Pair 5	Pre-treatment Bladder Invasion - Post-treatment Bladder Invasion	-0.01	0.193	-0.57	0.56
Pair 6	Pre-treatment Rectal Invasion - Post-treatment Rectal Invasion	-0.03	0.19	-1.75	0.08

Table 4 displays the relationship between the number of nodes in the iliac region before treatment and the subsequent MRI response. The data shows the distribution of MRI responses—complete response, partial response, stable disease, and progressive disease—across different types of iliac nodes. External iliac nodes are associated with 6 complete responses, 1 partial response, 0 stable disease, and 1 progressive disease, making a total of 8 patients. Internal iliac nodes show 7 complete responses, 0 partial responses, 1 stable disease, and 3 progressive diseases, totalling 11 patients. For presacral nodes, there was 1 case of stable disease, but no complete, partial, or progressive responses, with a total of 1 patient. Obturator nodes had 3 complete responses, 0 partial responses, 1 stable disease, and no progressive disease, totalling 4 patients. Paraaortic nodes had 1 stable disease and 5 progressive diseases, with a total of 6 patients. The category of multiple iliac nodes includes 3 complete responses, 1 partial response, and 3 progressive diseases, totalling 7 patients. The "No Nodes" group saw 44 complete responses, with no partial, stable, or progressive diseases, totalling 46 patients. In total, 63 patients had a complete response, 2 had a partial response, 4 had stable disease, and 12 had progressive disease, leading to an overall total of 81 patients. This table helps to elucidate how the number and type of nodes in the iliac region correlate with different MRI outcomes, emphasising the dominance of complete responses in patients without nodes or with external iliac nodes.

Table 4: Correlation Between Pre-Treatment Number of Nodes in the Iliac Region and MRI Response

Number Of Nodes in the Iliac Region Pre-treatment	MRI Response				Total
	Complete Response	Partial Response	Stable Disease	Progressive Disease	
External Iliac Nodes	6	1	0	1	8
Internal Iliac Nodes	7	0	1	3	11
Presacral Nodes	0	0	1	0	1
Obturator Nodes	3	0	1	0	4
Paraaortic Nodes	0	0	1	5	6
Multiple Iliac Nodes	3	1	0	3	7
No Nodes	44	0	0	0	46
Total	63	2	4	12	81

Table 5 provides a breakdown of MRI response by pre-treatment organ invasion, focusing specifically on bladder and rectal invasions. For pre-treatment bladder invasion, there was 1 complete response, 1 partial response, 1 stable disease, and 7 cases of progressive disease, totaling 10 patients. For rectal invasion, 1 complete response, 0 partial responses, 2 stable diseases, and 5 progressive diseases were noted, totaling 8 patients. The total number of patients across both categories is 81, with 63 patients having a complete response, 2 showing partial responses, 4 stable diseases, and 12 exhibiting progressive disease. This table suggests that pre-treatment bladder and rectal invasions do not have a strong correlation with favorable MRI responses, as both invasions show a high rate of progressive disease and fewer complete responses. This underscores the potential challenges in achieving a complete response in patients with these pre-treatment invasions.

doi: 10.21276/SSR-IIJLS.2025.11.5.33

Table 5: MRI Response Based on Pre-Treatment Organ Invasion (Bladder and Rectal)

	MRI Response				Total
	Complete Response	Partial Response	Stable Disease	Progressive Disease	
Pre-treatment Bladder Invasion	1	1	1	7	10
Pre-treatment Rectal Invasion	1	0	2	5	8
Total Patients	63	2	4	12	81

DISCUSSION

Response assessment in cervical cancer is an important feature to be discussed after treatment. This may vary depending on the stage, size, para-aortic lymph node status, bladder and rectal invasion, and morphology status. For the same stage, IIB, some patients may experience a complete response, while others may have a recurrence of the disease later in life. Different factors need to be assessed at the molecular level. From an institutional point of view, it gives us an idea about how things can be improved or precision in the work to be done for proper management. The factors that might be influencing recurrence or progressive disease might be its morphology, lifestyles, habits like smoking or alcohol intake, involvement of para-aortic nodes before treatment, and involvement of bladder and rectal invasion.

In a study by Charnalia *et al.,* 94.2% disease-free survival was observed at 12 months, 91.2% at 18 months, and 91.2% at 24 months [11]. Our study showed a 77.8% complete response rate post-treatment and 14.2% progressive disease. Since most of our patients were of stage IVA disease, second to stage IIB, this might have resulted in 14.2% progression of disease. In Nepal, patients usually present at a locally advanced stage with nodal involvement, bladder and rectal involvement; this might have resulted in the progressive stage of disease.

In a study conducted by Tsima *et al.,* 171 participants were involved, where 17% current smokers had twice the risk of cervical infection compared to non-smokers [12]. In our study, the number of patients with stable disease post-treatment was higher than pre-treatment, and the rate of progressive disease was 50% among smokers. The habit of smoking does not just influence progressive disease, but nodal involvement of the paraaortic node and bladder and bowel invasion have more influence.

In a study by Lee *et al.* on response assessment by PET CT scan, the 3-year overall survival rate was 80.4%, and the progression-free survival rate was 69.5%, with a significant reduction in SUV max after treatment [13]. In our study, assessment was performed using an MRI pelvis scan, which revealed a significant difference between pre-treatment and post-treatment MRI results regarding the size of the tumour, parametrial involvement, hydronephrosis, bladder and rectal involvement, and nodal involvement.

In a study conducted by Mbarki *et al.* response assessment of cervical cancer after 3 months resulted in a complete response in 95.6% and residual disease of 1 cm in 4.4% [14]. Our study's complete response was observed in 77.8% of cases, with most of them presenting in stage IVA. Stage IIB was analysed in our study, and a complete response rate of 94.5% was found, similar to Mbarki's study. Progressive disease was observed in 57.1% of stage IVA cases and 50% of stage IIIC2 cases. This highlights the importance of involvement of paraaortic nodes, bladder, and rectal invasion. An increase in stages has a poor response to treatment and worse progression-free survival.

Since response evaluation was done in the first 3 months of treatment, further longer follow-up scans might reflect true progression, recurrence, or response status of the patient [10]. Response might be affected by proper histomorphology and molecular study of the biopsy sample, which has not been included in the study. Similarly, other modalities of imaging, like PET-CT, have not been utilised, and only the MRI pelvis has been utilised to see the response [10,11]. Screening modalities for cervical cancer need to be followed to identify the disease on time for better cure results. Use of other modalities of imaging, such as PET-CT, needs to be done in case of MRI showing residual or progressive disease for comparison of status. A longer follow-up assessment for the same group of patients needs to be done to see

doi: 10.21276/SSR-IIJLS.2025.11.5.33

any changes in the course of the disease after curative intent of treatment [12].

CONCLUSIONS

This institute-based study on the assessment of response in total treated cases of cervical carcinoma showed a complete response in 77.8% of cases. However, for stage IIB, a complete response was observed in 94.5% of cases. This suggests that early-stage diseases respond better to curative treatment modalities, such as concurrent chemoradiation. As the stage progresses, the response to curative treatment decreases, and the likelihood of recurrence and disease progression increases. Early diagnosis and timely screening are essential to achieving good results for patients. Similarly, a habit like smoking status, adenocarcinoma, also results in the progression of the disease.

CONTRIBUTION OF AUTHORS

Research concept– Dhiraj Gupta, Asmita Rayamajhi
Research design– Mona Priyadarshini
Supervision– Sajjad Ahmed Khan, Gyanendra Man Singh Karki
Materials– Deepak Suman Jha
Data collection– Sajjad Ahmed Khan, Gyanendra Man Singh Karki
Data analysis and interpretation– Dhiraj Gupta
Literature search– Mona Priyadarshini, Asmita Rayamajhi
Writing article– Asmita Rayamajhi, Mona Priyadarshini
Critical review– Sajjad Ahmed Khan, Gyanendra Man Singh Karki, Deepak Suman Jha
Article editing– Asmita Rayamajhi
Final approval– Asmita Rayamajhi, Dhiraj Gupta, Mona Priyadarshini, Deepak Suman Jha, Sajjad Ahmed Khan, Gyanendra Man Singh Karki

REFERENCES

[1] International Agency for Research on Cancer. Nepal Fact Sheet. GLOBOCAN 2022. [Internet]. Lyon: IARC; 2022. Available from: https://gco.iarc.who.int/media/globocan/factsheets/populations/524-nepal-fact-sheet.pdf
[2] Zhang S, Xu H, Zhang L, Qiao Y. Cervical cancer: epidemiology, risk factors and screening. Chin J Cancer, 2020; 32(6): 720-25.
[3] Tomizawa K, Kaminuma T, Murata K, Noda SE, Irie D, et al. FIGO 2018 staging for cervical cancer: influence on stage distribution and outcomes in the 3D-image-guided brachytherapy era. Cancers, 2020; 12(7): 1770-75.
[4] Burmeister CA, Khan SF, Schäfer G, Mbatani N, Adams T, et al. Cervical cancer therapies: current challenges and future perspectives. Tumour Virus Res., 2022; 13: 200238.
[5] Todo Y, Watari H. Concurrent chemoradiotherapy for cervical cancer: background including evidence-based data, pitfalls of the data, limitation of treatment in certain groups. Chin J Cancer, 2016; 28(2): 221-26.
[6] Lim A, Sia S. Outcomes of chemoradiotherapy in cervical cancer—the Western Australian experience. Int J Radiat Oncol Biol Phys., 2012; 82(4): 1431-38.
[7] Endo D, Todo Y, Okamoto K, Minobe S, Kato H, et al. Prognostic factors for patients with cervical cancer treated with concurrent chemoradiotherapy: a retrospective analysis in a Japanese cohort. J Gynecol Oncol., 2015; 26(1): 12-18.
[8] McCormack M, Eminowicz G, Gallardo D, Diez P, Farrelly L, Kent C, et al. Induction chemotherapy followed by standard chemoradiotherapy versus standard chemoradiotherapy alone in patients with locally advanced cervical cancer (GCIG INTERLACE): an international, multicentre, randomised phase 3 trial. Lancet, 2024; 404(1): 1525-35.
[9] Woo S, Suh CH, Kim SY, Cho JY, Kim SH. Magnetic resonance imaging for detection of parametrial invasion in cervical cancer: an updated systematic review and meta-analysis of the literature between 2012 and 2016. Eur Radiol., 2018; 28(2): 530-41.
[10] Bourgioti C, Chatoupis K, Moulopoulos LA. Current imaging strategies for the evaluation of uterine cervical cancer. World J Radiol., 2016; 8(4): 342-48.
[11] Charnalia M, Chopra S, Mulani J, Popat P, Rath S, et al. RECIST 1.1 versus clinico-radiological response assessment for locally advanced cervical cancer: implications on interpreting survival outcomes of future trials. Int J Gynecol Cancer., 2024; 34(6): 817-23.
[12] Tsima BM, Motlhatlhedi K, Sharma K, Rantshabeng P, Ndlovu A, et al. The association between smoking and cervical human papillomavirus infection among

doi: 10.21276/SSR-IIJLS.2025.11.5.33

women from indigenous communities in western Botswana. PLoS One, 2024; 19(6): 153-59.

[13]Lee SH, Sung K, Ahn SH, Choi J, Lee KC, Kim SG. Assessment of radiation therapy response in cervical cancer using FDG PET-CT. Int J Radiat Oncol Biol Phys., 2015; 93(3): 593-97.

[14]Mbarki I, Randriamarosona N, Agbanglanon P, Touimi SH, Elkacemi H, et al. Evaluation of tumor response three months after concomitant chemoradiotherapy with high dose rate brachytherapy as a definitive treatment modality for locally advanced cervical cancer. Bull Cancer, 2022; 109(3): 280-86.