Computed Tomography Evaluation of Tumor Response in Oncology in Togo

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Abstract

Cancer is common in our setting and represents a real public health concern in sub-Saharan Africa. This work aimed to assess the role of computed tomography in the follow-up of patients treated for cancer in Togo. This was a retrospective descriptive study carried out over a period of one year, on patients with cancer, treated in the medical oncology unit of *CHU Sylvanus Olympio* and having undergone at least two CT scans after cancer treatment. Computed tomography evaluation was performed according to the RECIST 1.1 guidelines. We had found 46 patients. The mean age of the patients was 54.22 years with a female predominance (sex ratio 1:2.5). Cancers mainly involved the urogenital system (60.8%) followed by the digestive system (28.3%). Carcinoma represented 93.5% of cases, mainly adenocarcinoma (45.7%). 74 target lesions were present at baseline, with 18.9% and 11.6% disappearing at the first and second assessments respectively. 36 non-target lesions were present at baseline, with 25% and 22.2% disappearing at the first and second assessments respectively. New lesions were found in the abdominal region in 54.5% of cases and in the thoracic region in 41.3% at the first and second assessments respectively. 58.7% of patients had a stable disease at the first assessment and 39.1% had progression at the second assessment. 50% of them had received chemotherapy in combination with surgery. Computed tomography using the RECIST 1.1 guidelines is a necessity in monitoring tumor extensions and in the follow-up of cancer patients.

Keywords

Cancer, Response Tumoral, Computed Tomography, RECIST 1.1, Togo

1. Introduction

Cancer is common in our setting and represents a real public health concern in sub-Saharan Africa. It is one of the main causes of morbidity and mortality worldwide: there were approximately 18.1 million new cases and 9.6 million cancer-related deaths in 2018 [1]. Almost one in two deaths worldwide is due to cancer [1].

At the time of the first diagnosis of cancer, the main goal of treatment is to remove the entire tumour, if possible (either as a single treatment or with a combination of surgery, radiotherapy and chemotherapy, and sometimes with newer anti-cancer treatments). Cancer treatment is one of the most complex aspects of medical care. It involves a multidisciplinary medical team (general practitioners, gynaecologists or other specialists, oncologists, radiologists, surgeons and pathologists) and many other health professionals. Oncology imaging is therefore integrated into the patient's care pathway.

Managing patients with this condition requires a multidisciplinary medical team comprising the radiologist. One of the major challenges of slice imaging in oncology lies in the evaluation of the response to treatment. Standardized treatment response evaluation guidelines are therefore essential in daily clinical practice for therapeutic decision making and treatment monitoring. Thus, the WHO published in 1979 [2] the first standardized guidelines for evaluating response to therapy based on tumor size. These guidelines were revised in 1990 [3] and in 2009 [4] under the name RECIST version 1.1.

However, despite the rapid development of evaluation guidelines for cancer treatment in oncology, there are few studies in sub-Saharan Africa that have used these guidelines in monitoring cancer treatment. We therefore undertook this work with the aim to evaluate the response to cancer treatment using computed tomography.

2. Materials and Methods

2.1. Study Procedures and Ethical Considerations

Our study was descriptive and retrospective and took place in the medical oncology unit of Centre Hospitalier Universitaire Sylvanus Olympio (CHU Sylvanus Olympio) in Lomé (Togo) over a period of 12 months, from January to December 2019.

We included in our study all the files of patients treated for cancer in the oncology department of the CHU Sylvanus Olympio:

- with a primary cancer found, having benefited from a histological examination.
- who underwent a CT scan before the start of treatment and at least two CT scans during or after treatment.
- followed for at least 06 months.
- have received the following treatments: chemotherapy, radiotherapy, surgery or targeted therapy.

For each file, the following data were collected:

- demographic characteristics.
- clinical diagnostic, anatomopathologic and therapeutic data.
- medical imaging data (baseline, first CT scan and second CT scan after treatment).

All patients had undergone an initial CT scan before onset of cancer treatment and at least two scans after treatment. The time interval between post-treatment CT scans was a minimum of three months.

The reference measurement plane was that of the longest axial diameter.

The measurements were taken with a digital ruler in the various medical imaging units. The measurements in millimeters (mm) of the longest diameter of each target lesion on the axial CT sections were recorded. The other "non-target" lesions were noted.

In total, the target lesions were measured with a maximum of five lesions per patient, two per organ and they were chosen from among the most representative, the most voluminous, and the most reproducible lesions.

2.2. Data Collection

The files were entered into a database designed using Epi Info 7 computer software, with attention to confidentiality and anonymity.

Tables and graphs were produced using Microsoft Office Excel 2019 and data entry was done using Microsoft Word 2019 software.

2.3. Ethical and Deontological Considerations

To preserve the anonymity of patients, a serial number was assigned to each data collection sheet, thus ensuring the confidentiality of the information collected.

3. Results

3.1. Sociodemographic Data

During the study period, we identified 46 patients with a malignant tumor who had undergone at least two CT scans after cancer treatment.

The mean age of the patients was 54.22 years (range 24 - 72 years). The age groups between 50 and 59 years and between 60 and 69 years were the most represented with respectively 12 patients (26%) and 16 patients (34.8%) (Figure 1).

33 patients (71.7%) were female and 13 patients (28.3%) were male, corresponding to a male to female sex ratio of 1:2.5. All male patients were between 50 and 70 years of age (Figure 1).

3.2. Topography of Primary Lesions

Malignant tumors mainly affected the urogenital system with 28 cases (60.8%) and the digestive system with 13 cases (28.3%) (Table 1).

3.3. Histological Type

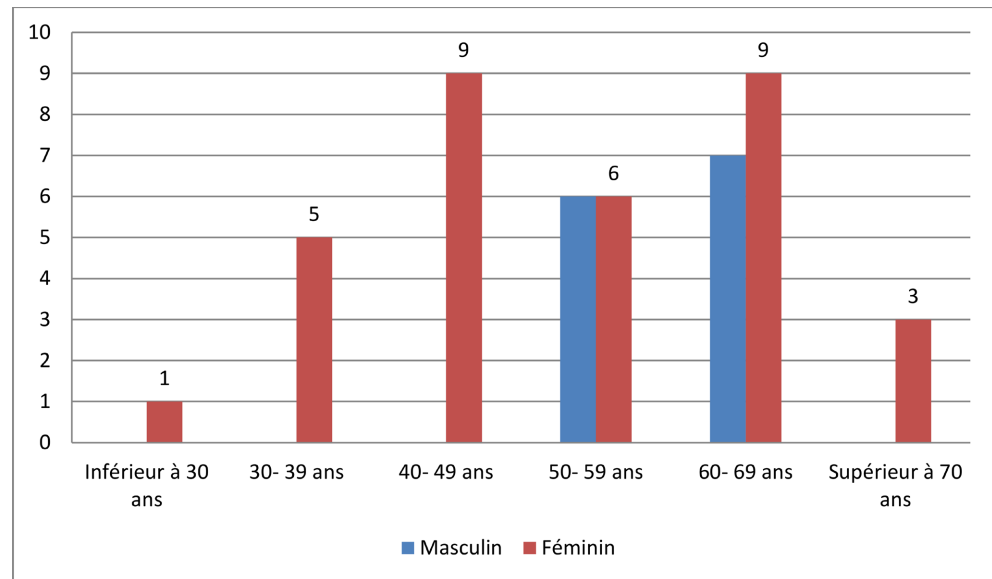Carcinoma was found in 93.4% of cases (43 cases), followed by lymphoma in

Figure 1. Distribution of patients according to age and gender.

Table 1. Distribution according to topography and primary lesion.

	Number	Percentage (%)
ENT*		
*C*11.9 Cavum	1	2.2
Digestive system		28.3
*C*16 Stomach	5	
*C*18 Colon	2	
*C*20 Rectum	4	
*C*25 Pancreas	2	
Respiratory system		2.2
*C*34 Lungs	1	
Genitourinary system		**60.8**
*C*50 Breast	10	
*C*53 Cervix	8	
*C*54 Endometrium	3	
*C*56 Ovary	4	
*C*61 Prostate	2	
*C*67 Bladder	1	
Musculoskeletal system		6.5
*C*49.1 Arm	1	
*C*49.5 Inguinal region	1	
*C*49.5 Buttocks	1	
Total	**46**	**100.0**

4.4% of cases (2 cases) and sarcoma in 2.2% of cases (1 case).

3.4. Computed Tomography (CT) Assessment

Target lesions

During the baseline assessment, 74 target lesions were found (Figure 2, Figure 3).

At the first assessment, 60 target lesions were found (*i.e.* a disappearance of 18.9%) in 33 patients (71.7%).

At the second assessment, target lesions persisted in 29 patients (63%), with a total of 53 target lesions, *i.e.* 11.6% disappearance from the first assessment.

The breast cancer was the one with the most significant regression of target lesions (30%) at the 1st evaluation and 40% at the 2nd evaluation (Table 2).

The target lesions predominated in the abdominal region throughout the baseline, the 1st and 2nd assessment in 28.4%, 28.3% and 30.2% of cases respectively (Table 2).

Carcinoma was the histologic type that presented the most target lesions
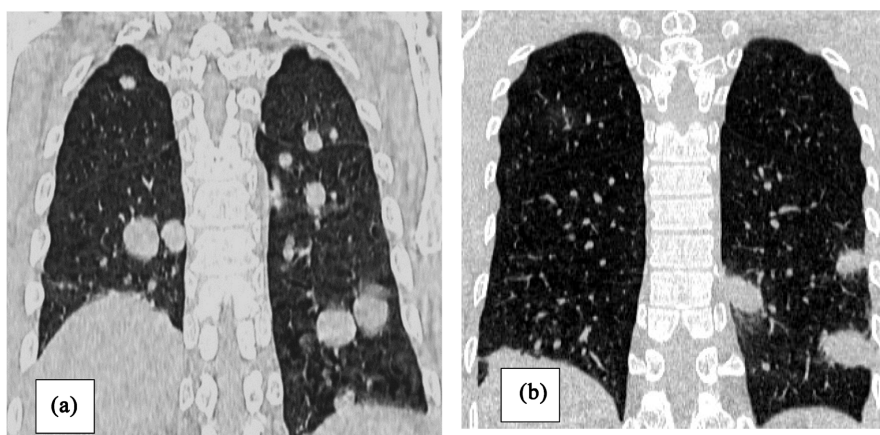
Figure 2. 55-year-old patient with left breast cancer with target lesions of bilateral lung metastases on baseline (a) and incomplete disappearance of targets lesions on assessment after the start of treatment (b).

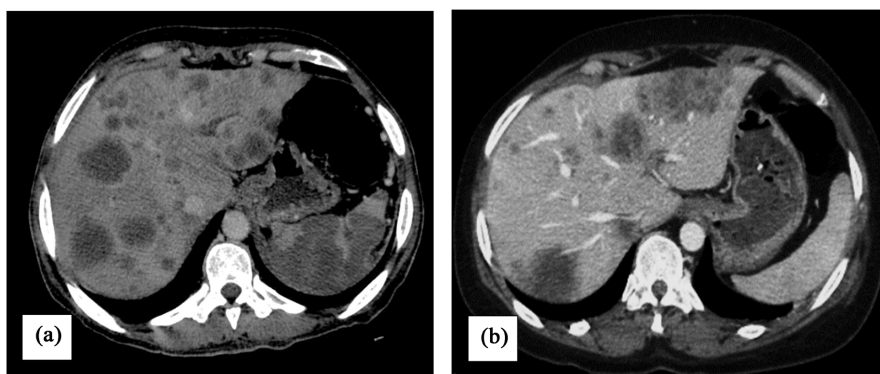**Figure 3.** 59-year-old patient with stomach cancer, with target lesions of liver and spleen (a) metastases on baseline, and disappearance of targets lesions on assessment (complete on spleen and incomplete on liver) after the start of treatment (b).

Table 2. Evolution of target lesions according to the site of the target lesions.

	Baseline	First assessment	Second assessment
Head and neck			
Brain	1	1	1
Thorax			
Lungs	3	4	4
Breasts	10	7	6
Abdomen			
Liver	10	10	10
Pancreas	2	2	2
Stomach	4	1	1
Peritoneum	4	4	3
Colon	1	0	0
Pelvis			
Cervix	7	5	3
Endometrium	3	1	1
Ovary	4	3	2
Prostate	2	1	1
Bladder	1	1	1
Soft tissues	4	2	1
Lymph nodes	18	18	17
Total	74	60	53

(93.2%; 64 lesions) before treatment, with an 18.8% and 10.7% disappearance of target lesions at the 1st and 2nd assessment respectively (Table 3).

Cancers of the urogenital system were the most common source of target lesions (68.9%; 51 lesions), with a disappearance of these by 17.6% at the first assessment and 2.3% at the second assessment (Table 4).

The target lesions that were treated with chemotherapy only were 43 (58.1%), with a disappearance of 11.6% and 13.15% of them at the 1st and 2nd assessment respectively (Table 5).

Non-target lesions

At the baseline assessment, non-target lesions were present in 25 patients (54.3%), with 36 non-target lesions and were located mainly in the thoracic region in 55.5% of cases (Table 6).

At the first assessment, non-target lesions persisted in 25 patients (54.3%), with 27 non-target lesions out of 36, *i.e.* a disappearance of 25% of the lesions. They were located in the thoracic region in 48.2% of cases (Table 6).

At the second assessment, the lesions persisted in 18 patients (39.1%), with 21

Table 3. Evolution of lesions according to histological type.

	Carcinoma	Sarcoma	Lymphoma
Target lesions			
Baseline	69	2	3
1st assessment	56	1	3
2nd assessment	50	0	3
Non target lesions			
Baseline	35	0	1
1st assessment	26	0	1
2nd assessment	21	0	0
New lesions			
1st assessment	11	0	0
2nd assessment	28	1	0

Table 4. Evolution of lesions according to the site of the primary lesion.

	ENT*	Digestive	Respiratory	MS	GU
Target lesions					
Baseline	1	15	3	4	51
1st assessment	1	12	3	2	42
2nd assessment	1	11	0	0	41
Non-target lesions					
Baseline	0	4	2	0	30
1st assessment	0	3	1	0	22
2nd assessment	0	6	1	0	14
New lesions					
1st assessment	0	1	1	0	9
2nd assessment	0	12	1	0	16

*ENT: Ear, Nose, and Throat.

non-target lesions out of 27, *i.e.* a 22.2% disappearance rate. They were found mostly in bones in 52.4% of cases (Table 6).

Carcinoma was the histologic type that presented the most non-target lesions (97.2%) before treatment, with a disappearance of non-target lesions of 25.7% at the first assessment and 19.2% at the second. There were no non-target lesions in the sarcoma cases (Table 3).

Cancers of the urogenital system had the most non-target lesions (83.3% of cases) with a disappearance of 26.6% of them at the first assessment and 36.3% at the second assessment (Table 4).

Table 5. Evolution of lesions according to treatment given.

	Surgery + Chemotherapy	Surgery + Chemotherapy + Radiotherapy	Chemotherapy + Radiotherapy	Chemotherapy	Chemotherapy + Radiotherapy + Targeted therapy
Target lesions					
Baseline	17	4	3	43	7
1st assessment	14	3	2	38	3
2nd assessment	12	3	2	33	3
Non-target lesions					
Baseline	16	3	2	**13**	2
1st assessment	12	2	0	**11**	2
2nd assessment	12	1	1	**6**	1
New lesions					
1st assessment	2	1	2	5	1
2nd assessment	19	2	2	5	1

Table 6. Distribution by site of non-target lesions.

	Baseline	First assessment	Second assessment
Thorax			
Pleurisy			
Micronodules	20	13	6
Septal thickening			
Alveolar focus			
Abdominal			
Ascites	6	4	4
Bones	10	10	11
Total	36	27	21

Non-target lesions having benefited from surgery and chemotherapy predominated with 16 lesions (44.44%), with a disappearance of 25% of them at the 1st and 2nd assessments (Table 5).

New lesions

At the first assessment, there were 11 new lesions (Figure 4) and they mainly occurred in the abdominal region in 54.5% of cases (6 lesions) (Table 7).

At the second assessment, there were 29 new lesions and they mainly occurred in the thoracic region (41.3%; 12 lesions) (Table 7).

Carcinoma was the histologic type responsible for all new lesions (100%) at the first assessment and 96.5% of new lesions (29 lesions) at the second assessment (Table 3).
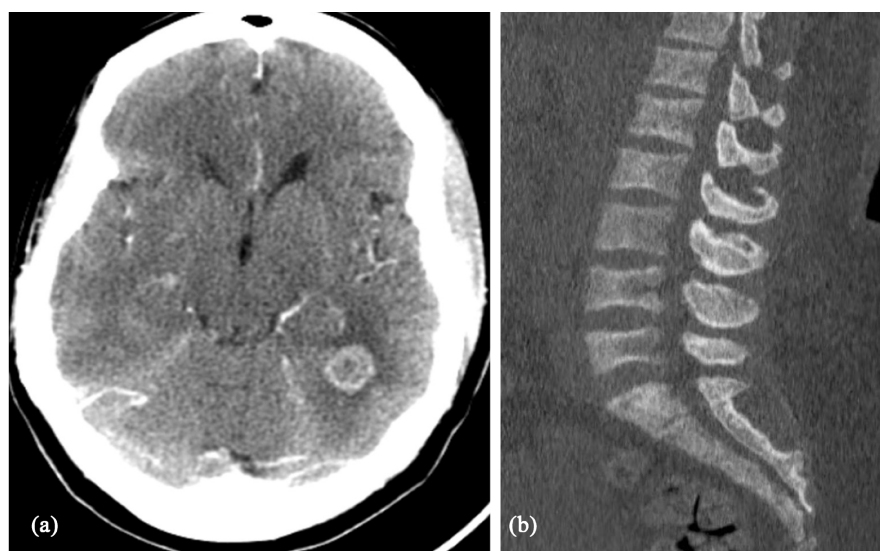
Figure 4. 64-year-old patient with breast cancer (a), with appearance of new lesions of brain (a) and bone (b) on the first assessment after the start of treatment.

Table 7. Distribution by site of appearance of new lesions.

	First assessment	Second assessment
Cerebral		
Brain	2	2
Thoracic		
Pulmonary micronodules	0	8
Pleurisy	1	4
Abdominal		
Hepatic nodules	4	3
Splenic nodule	0	1
Ascites	2	5
Pelvic		
Ovaries	0	1
Bones	2	3
Lymph nodes	0	2
Total	11	29

Table 8. Evolution of the overall response.

	First assessment	Second assessment
Partial response	13	10
Stable disease	27	18
Progression	6	18
Total	46	46

Cancers of the urogenital system presented the most new lesions at the first and second assessments, contributing 81.8% of new lesions (9 lesions) and 55.1% of new lesions (16 lesions) respectively (Table 4).

New lesions appeared mostly in patients on chemotherapy at the first assessment (45.4%; 5 lesions) and mostly in patients on chemotherapy combined with surgery at the second assessment (65.5%; 29 lesions) (Table 5).

Overall response

Patients presented with stable disease in 58.7% of cases (27 patients) at the first assessment and with disease progression and stability in 18 patients (39.1%) at the second assessment (Table 8).

4. Discussion

Our study involved 46 patients treated for cancer, whose mean age was 54.22 years. Our results were similar to those of Kone *et al.* in 2018 in Mali [5], Darré *et al.* in 2016 in Togo [6] and Bourio *et al.* in 2015 in Senegal [7] which reported a mean age of 50, 50.4 and 50 years respectively. This confirms that cancer is more common in adulthood.

A female predominance was found (72%) in our study with a sex ratio of 1:2.5. This is in line with the studies by Kone *et al.* in 2018 in Mali [5], Goumbri *et al.* in 2006 in Burkina Faso [8], Ndahindwa *et al.* in 2004 in Rwanda [9] and Egue *et al.* in 2016 in Benin [10] which found a female predominance of 83.3%, 54.9%, 54.4% and 56% respectively. This could be explained by the high proportion of gynecomammary cancers in women, and the fact that 51.4% of the general population is made of women according to the fourth general census in Togo [11].

According to literature, radiotherapy is involved in the treatment of around two-thirds of cancers and half of cancers that are curable [12]. The percentage of long-term survivors after radiotherapy alone is 27% while surgery alone contributes 50%, surgery + radiotherapy 14%, chemotherapy 3% and chemotherapy + another treatment 6% [12]. The low rate of patients having received radiotherapy is due to the unavailability of a radiotherapy center in health facilities in Togo. Four patients had received radiotherapy in health facilities of neighboring countries.

The baseline CT scans revealed a predominance of target lesions in the abdomen (28.4%), specifically in the liver, pancreas, stomach, peritoneum and colon at 13.6%, 2.5%, 5.4%, 5.4% and 1.3% respectively. No primary hepatic tumor was detected during our work; all liver lesions were metastatic lesions. This corroborates the data in literature [13] [14] which suggest that the liver is considered as a filter organ in the circulatory system, hence these secondary locations. After treatment, hepatic nodules persisted on both the first and second assessment.

The prevalence of peritoneal nodules was 5.4% and they were found in four patients, two of whom had cervical cancer, one had colon cancer and the last one had an ovarian cancer. According to literature, peritoneal carcinomatosis re-

sulting from implantation of cells, nodules and even cancerous masses on the abdominal peritoneum is a frequent complication of cancers of the digestive and genital systems, but also to a lesser extent of the urinary system [15].

Lymph node involvement was present in 24.4% of cases. According to the natural history of cancers [13], the lymphatic route is the most frequent route of dissemination of carcinomas and the most lymphophilic cancers are carcinomas. This is consistent with the results of our study which indicated carcinoma as the predominant histological type.

One target lesion was in the brain (1.3%); it was a metastatic lesion in a patient with infiltrative ductal carcinoma of the breast. According to literature [16], 5% to 15% of patients with breast cancer develop a secondary brain tumor. This does not occur until later in the course of the metastatic disease and half of such patients would remain asymptomatic. The brain lesion persisted during post-treatment assessment despite radiotherapy, although the treatment administered was the recommended one [17].

Pleurisy (45%), pulmonary micronodules (45%) and alveolar focus (5%) were the main non-target lesions of the thoracic region, representing 55.5% at the baseline assessment. The cancers mainly responsible for these lesions were breast cancer (35%), cervical cancer (25%), endometrial cancer (15%), ovarian cancer (10%), prostate cancer (5%), lung cancer (5%) and stomach cancer (5%). Our results are similar to those of Badri [18] who found as primary cancers at the origin of the various pleuropulmonary metastases: breast cancer (27.6%), gastrointestinal cancers (15.8%), genital cancers (9.2%), sarcomas (7.8%), kidney cancer (5.2%), bladder cancer (5.2%), prostate cancer (3.9%), ENT cancers (3.9%), thyroid cancers (3.9%), skin cancer (2.6%) and primary cancer of undetermined origin (14.4%). There was a significant disappearance of these lesions during the second assessment.

Bone lesions were second to thoracic lesions (27.7%). According to Debiais [19] and Bouabid [20], it is the third site of cancer metastases after the liver and the lung. Bone metastases are secondary to breast or prostate cancer in 84% of cases, to thyroid cancer in 50% of cases, to lung cancer in 44% of cases and to kidney cancer in 37% of cases [21]. In our study, breast cancer was the main source of these lesions (50%). These lesions persisted at the post-treatment evaluation.

Ascites was the only non-target lesion found in the abdominal area (16.8%). Ovarian cancer was the main source of these lesions (50%) due to the peritoneal location of the ovary. This corroborates the data in literature showing that neoplasms most often associated with malignant ascites are adenocarcinomas of the ovary, breast, colon, stomach and pancreas [22].

The new lesions primarily involved the abdominal region at the first assessment (50%), and the thorax at the second assessment (50%). This is consistent with the natural history of cancer [23] which labels the lungs as filter organs in blood circulation, hence a predominant site for secondary tumors.

5. Conclusion

In conclusion, cancers are present in Togo among the population at all ages. Breast and cervical cancers remain the most common. Computed tomography evaluation using the RECIST version 1.1 guidelines makes it possible to follow the evolution of cancerous lesions as well as their extensions, thus playing a crucial role in their management. Most patients had stable disease. Breast cancer was the one with the most significant regression disease.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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