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Incidence and management of chemotherapy-related local complications in cancer patients in Conakry, Guinea

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Abstract

Introduction: Chemotherapy-related local complications (CRLC), such as phlebitis and extravasation, can significantly affect patient quality of life and disrupt treatment continuity. These complications are poorly documented in sub-Saharan Africa, where structural and organizational constraints may contribute to increased incidence and severity. This study aimed to determine the incidence, characteristics, and associated factors of CRLC in an oncology unit in Guinea.

Materials and methods: A prospective descriptive and analytical study was conducted at the Oncology Department of Donka University Hospital, Guinea, from November 2020 to February 2021. Patients with histologically confirmed cancers receiving intravenous chemotherapy were included. Two groups were compared: patients with and without CRLC. Sociodemographic, clinical, and therapeutic data were analyzed using appropriate statistical tests.

Results: Among 88 patients (84.1% female; mean age 45.8 ± 16.7 years), 31 (35.2%) developed at least one CRLC. Out of 193 chemotherapy cycles, 51 CRLC episodes (26.4%) were recorded, including phlebitis (15.0%) and extravasation (11.4%). Most frequent protocols were doxorubicin + cyclophosphamide (AC) and epirubicin + cyclophosphamide (EC), accounting for 33.0% of cases, followed by docetaxel monotherapy (25%). CRLCs occurred during the first four cycles (45.2%), predominantly grade 2 (82.4%), with favorable outcomes within 10 days (96.1%). Peripheral venous access was used almost exclusively (100% with CRLC vs. 96.5% without CRLC, p = 0.291). No statistically significant predictive factor was identified. In 9.1% of cases, delayed consultation caused extensive lesions requiring surgical excision, leading to a temporary chemotherapy interruption without permanent functional sequelae.

Conclusion: CRLCs are frequent in our resource-limited setting, affecting more than one-third of patients and one-quarter of chemotherapy cycles. Phlebitis and extravasation occurred mainly during the first cycles, with most events being moderate but some requiring surgical management. These findings highlight the urgent need to strengthen prevention strategies, staff training, and access to appropriate vascular devices in order to reduce their incidence and ensure treatment continuity.

Keywords: Chemotherapy, Extravasation, Phlebitis, Local toxicity, Sub-Saharan Africa

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Introduction

Cancer represents a major global public health challenge, with an increasing incidence. Approximately 19 million new cases are diagnosed annually worldwide (1). In Guinea, Globocan estimates around 8,700 new cancer cases per year (2).

Following histological confirmation, treatment strategies depend on tumor type and stage, including chemotherapy, surgery, radiotherapy, or targeted therapies (3). Chemotherapy remains central to cancer treatment, involving cytotoxic agents administered alone or in combination for curative or palliative purposes. Common routes of administration include oral, intravenous, intramuscular, subcutaneous, intrathecal, intraperitoneal, intra-arterial, or topical, with intravenous administration being the most common, usually via peripheral veins in the arm or hand. In high-resource settings, chemotherapy may be administered via central venous catheters or implantable ports, often combined with infusion pumps, ensuring controlled flow (4).

Chemotherapy exposes patients to multiple adverse effects, including local complications at the infusion site, such as extravasation, phlebitis, and, in severe cases, tissue necrosis (5–7). These events can cause intense pain, lead to treatment interruption or delay, and occasionally result in functional sequelae (8).

Estimating CRLC incidence is challenging due to underreporting and the lack of centralized registries. Reported extravasation rates range from 0.1–6% for peripheral lines and 0.3–4.7% for central catheters (9,10). Data on chemotherapy-induced phlebitis are highly heterogeneous, ranging from 3% to 89%, depending on diagnostic criteria and methodology (11).

Several risk factors for CRLC have been identified, with extravasation risk depending on patient factors (fragile or sclerosed veins, obesity, prolonged infusion) and procedural factors (inexperienced staff, multiple punctures, bolus injections) (9). A UK study of 263 women treated with peripheral anthracyclines identified severe phlebitis as associated with repeated use of the same arm, younger age, high doses, comorbidities, injection pain, and cumulative cycles (12).

Although these complications are well described in high-income countries, they pose an even greater challenge in sub-Saharan Africa, where health systems face significant infrastructure, human resources, and medical device limitations (13). In Guinea, oncology care is primarily provided at Donka University Hospital in Conakry. This center faces many challenges, including shortages of central venous catheters, lack of specific antidotes such as dexrazoxane (used in anthracycline extravasation), insufficient trained personnel, and frequent delays in complication management. The absence of standardized protocols and the frequent use of inappropriate vascular access devices increase the morbidity risk from these adverse events. Despite these challenges, no local study has documented to date the extent, clinical manifestations, or associated factors of complications related to the intravenous administration of cytotoxic treatments.

In this context, it has become crucial to deepen the understanding of these complications and to identify strategies for improving their management. This study aims to analyze the incidence, clinical profiles, and risk factors of CRLC in cancer patients in Conakry, Guinea.

Materials and methods

Study setting, design, and period

This was a prospective descriptive and analytical study conducted over three months, from November 15, 2020, to February 15, 2021, at the Oncology Department of Donka University Hospital (Guinea).

Study population and selection criteria

All patients with histologically confirmed cancer receiving chemotherapy during the study period were included. Patients with pre-existing CRLC or who did not consent were excluded.

Sample size justification

The sample size was not predetermined by statistical calculation. Instead, all eligible patients treated with

intravenous chemotherapy during the three-month study period were consecutively included. This exhaustive recruitment allowed us to capture the full range of CRLC occurring in routine practice in our setting.

Variables collected

Collected variables included:

- Sociodemographic: age, sex, comorbidities;
- Clinical: cancer type, stage;
- Therapeutic: chemotherapy protocol, administration route, puncture attempts, catheter gauge, cycle number;
- CRLC: type, grade according to the Common Terminology Criteria for Adverse Events (CTCAE v5.0), time to onset, evolution;
- Corrective and preventive measures.

The CRLC diagnosis was based on clinical examination of the injection site. Patients were evaluated on infusion day and at each subsequent cycle. In case of complaints, patients contacted the team or presented to the hospital, where assessment focused on general condition and injection site. No additional imaging (Doppler ultrasound, thermography) was performed, as thermography was unavailable in Guinea.

Data analysis

Data were analyzed using SPSS software (version 21). Qualitative variables were expressed as frequencies and percentages, and quantitative variables as means ± standard deviation.

CRLC incidence was calculated using two approaches:

- Patient-based incidence: proportion of patients experiencing ≥1 episode during the study period;
- Cycle-based incidence: proportion of chemotherapy cycles complicated by CRLC.

Frequencies of specific complications (phlebitis, extravasation) were expressed as percentages of total cycles and relative proportions among all episodes.

For comparison, patients were divided into two groups: with CRLC and without CRLC. Factors associated with CRLC occurrence were analyzed using Chi-square or Fisher's exact tests for qualitative variables and t-test or Mann–Whitney test for quantitative variables. A p-value < 0.05 was considered statistically significant.

Ethical considerations

The study was conducted following the principles of the Declaration of Helsinki. The protocol was reviewed and approved by the scientific committee of the Oncology Department of Donka University Hospital. All data were anonymized and treated confidentially. Written informed consent was obtained from patients at the time of initial care and recorded in their medical files.

Results

Frequency and distribution of local complications

Among 88 patients included, 31 (35.2%) experienced at least one CRLC episode during follow-up, while 57 (64.8%) did not experience any. A total of 193 chemotherapy cycles were administered, of which 51 (26.4%) were complicated by CRLC. Among these episodes, 29 were phlebitis (15.0% of cycles) and 22 were extravasations (11.4% of cycles). Phlebitis accounted for 56.9% of all recorded episodes.

Sociodemographic characteristics

The mean age was 45.8 ± 16.7 years (range: 4–81 years). Females predominated (84.1%), with a higher proportion in the CRLC group (94.0%) than the non-CRLC group (79.0%) ($p = 0.074$). The most frequent comorbidities were hypertension (25.8% with CRLC vs. 12.2% without CRLC) and obesity (58.1% vs. 38.7%), without significant differences (Table 1).

Table 1. Sociodemographic characteristics according to the occurrence of CRLC.

Characteristics	CRCL	Without CRCL	Total	p-value
Mean age (years)	44.1±16.2	46.7±13.4	45.8±16.6	0.835
Sex				
Female	29 (94.0 %)	45 (79.0 %)	74 (84.1 %)	0.074
Male	2 (6.4 %)	12 (21.0 %)	14 (15.9 %)	
Comorbidities				
Hypertension	8 (25.8 %)	7 (12.2 %)	15 (17 %)	
Diabètes	3 (9.7 %)	3 (9.7 %)	6 (6.8 %)	0.556
Obesity/ Overweight	18 (58.1 %)	12 (38.7 %)	30 (34.1 %)	
HIV	1 (3.2 %)	-	1 (1.1 %)	
Primary site				
Breast	20 (64.5 %)	30 (53.0 %)	50 (56.8 %)	
Digestive	7 (22.6 %)	4 (7.0 %)	11 (14.8 %)	
Lymph node		9 (16.0 %)	9 (10.2 %)	
Gynecologic	1 (3.2 %)	4 (7.0 %)	5 (5.7 %)	0.280
Soft tissue	1 (3.2 %)	2 (3.5 %)	3 (3.4 %)	
Ear, Nose, Throat	-	2 (3.5 %)	2 (2.3 %)	
Urologic	-	3 (5.9 %)	3 (3.4 %)	
Others[a]	2 (6.4 %)	3 (5.9 %)	5 (5.7 %)	
Stage				
Locally advanced	24 (77.4 %)	45 (79.0 %)	69 (78.4 %)	0.091
Metastatic	7 (22.6 %)	12 (21.0 %)	19 (21.6)	

[a]: *skin, oral cavity, lung, eye.*

Clinical and therapeutic characteristics

Breast cancer was the most common tumor site in both groups (64.5% with CRLC vs. 53.0% without CRLC, p = 0.283). Most patients were locally advanced and treated primarily with curative chemotherapy, without a significant difference between groups (77.4% with CRLC vs. 79.0% without CRLC; p = 0.091) (Table 2).

The most frequently administered protocols were AC and EC, accounting for 33.0% of cases, followed by docetaxel monotherapy (25.0%), with no significant difference between groups. Peripheral venous access was used almost exclusively (100% with CRLC vs. 96.5% without CRLC, p = 0.291). Fewer than four cycles were administered in 45.2% of patients with CRLC versus 56.1% without CRLC (p = 0.332) (Table 3).

Table 2. Clinical characteristics according to the occurrence of CRLC.

Characteristics of CRLC

Among the 51 CRLC episodes, grade 2 complications predominated, representing 100% of phlebitis and 59.1% of extravasations. Most complications occurred during the first four cycles. Evolution was favorable within 10 days in 100% of phlebitis cases (Table 4).

Table 3. Therapeutic characteristics according to the occurrence of CRCL

Characteristics		CRCL	Without CRCL	Total	p-value
Protocol	AC/EC	12 (38,7 %)	17 (29.8 %)	29 (33.0 %)	0.182
	Docetaxel	8 (25.8 %)	14 (24.6 %)	22 (25.0 %)	
	Cyclophosphamide, doxorubicin, vincristine, prednisone	-	9 (15.8 %)	9 (10.2 %)	
	Carboplatin - paclitaxel	1 (3.2 %)	8 (14.0 %)	9 (10.2 %)	
	Calcium folinate – 5-fluorouracil (5-FU) – oxaliplatin	6 (19.3 %)	4 (7.0 %)	6 (6.8 %)	
	Doxorubicin – ifosfamide	1 (3.2 %)	-	4 (4.5 %)	
	Cisplatin – 5-FU	1(3.2 %)	2 (3.5 %)	3 (3.4 %)	
	Doxorubicin – dacarbazine	1 (3.2 %)	-	1 (1.1 %)	
	Bleomycin – etoposide – cisplatin	-	-	1 (1.1 %)	
	Docetaxel – cisplatin - 5-FU (DCF)	1 (3.2 %)	-	1 (1.1 %)	
	Carboplatin - etoposide	-	1 (1.8 %)	1 (1.1 %)	
	Calcium folinate – 5-FU – irinotecan	-	1 (1.8 %)	1 (1.1 %)	
	Doxorubicin - vincristine	-	1 (1.8 %)	1 (1.1 %)	
Access route	Peripheral	31 (100 %)	55 (96.5 %)	86 (97.7 %)	0.091
	Central	-	2 (3.5 %)	2 (2.3 %)	
Number of puncture attempts	Once	19 (61.3 %)	33 (57.9 %)	52 (59.1 %)	0.757
	More than once	12 (38.7 %)	24 (42.1 %)	36 (40.9 %)	
Number of cycles received	< 4	14 (45.2 %)	32 (56.1 %)	46 (52.3 %)	0.332
	≥ 4	17 (54.8 %)	25 (43.9 %)	42 (47.7 %)	
`Catheter gauge	Gauge 20	20 (64.5 %)	44 (77.2 %)	64 (72.7 %)	0.093
	Gauge 18	2 (6.5 %)	-	12 (13.6 %)	

	Gauge 22	7 (22.5 %)	10 (17.5 %)	19 (21.6 %)
	Gauge 24	2 (6.5 %)	3 (5.3 %)	5 (5.7 %)

Table 4. Characteristics of CRCL.

Characteristics		CRCL		Total
		Phlebitis	Extravasation	
Grade	1		7 (31,8 %)	7 (13.7 %)
	2	29 (100 %)	13 (59,1 %)	42 (82.4 %)
	3	-	2 (9,1 %)	2 (3.9 %)
Time to onset	< 10 days	14 (48.3 %)	1 (4.5 %)	15 (29.4 %)
	10 – 20 days	15 (51.7 %)	10 (45.5 %)	25 (49.0 %)
	> 20 days	-	11 (50.0 %)	11 (21.6 %)
Cycles involved	First 4 cycles	25 (86.2 %)	19 (85.4 %)	44 (86.3 %)
	After 4th cycle	4 (13.8 %)	3 (13.6 %)	7 (13.7 %)
Outcome (within 10 days)	Favorable	29 (100 %)	20 (90.9 %)	49 (96.1 %)
	Unfavorable	-	2 (9.1 %)	2 (3.9 %)

Corrective and preventive measures

No patient received specific antidote treatment. The measures implemented were mainly symptomatic and adapted to the type and severity of the complications:

- Grade 2 phlebitis: venous access was changed, and rest and clinical monitoring were provided, with favorable evolution within 10 days (Figure 1).
- Grade 1 extravasation: ice application and observation were used, with rapid healing.

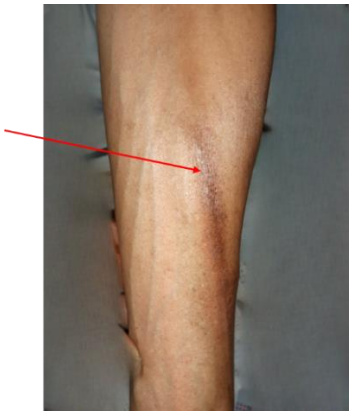

Figure 1. Phlebitis with serpiginous hyperpigmentation induced by DCF chemotherapy.

- Grade 2 extravasation: local care after blister rupture and, in some cases, ice application were provided, leading to complete recovery (Figure 2).

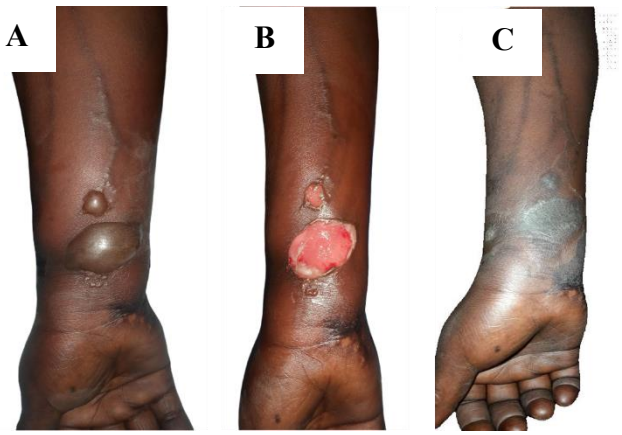

Figure 2. Extravasation secondary to chemotherapy under the EC protocol, grade 2 according to CTCAE v5.0. (A) presence of blisters on the inner aspect of the lower third of the right forearm, associated with serpiginous hyperpigmentation along the venous pathways. (B) blister rupture; (C) healing with residual hyperpigmentation after 13 days of local care.

- Severe complications or delayed consultation: some extravasations progressed to extensive lesions required surgical excision in 9.1% of cases (Figure 3). These interventions did not result in any permanent functional sequelae but led to temporary interruption in chemotherapy until clinical improvement was achieved. Residual hyperpigmented scars were observed, without impact on mobility or treatment resumption.

No specific preventive measures were implemented to limit the occurrence of phlebitis or extravasation.

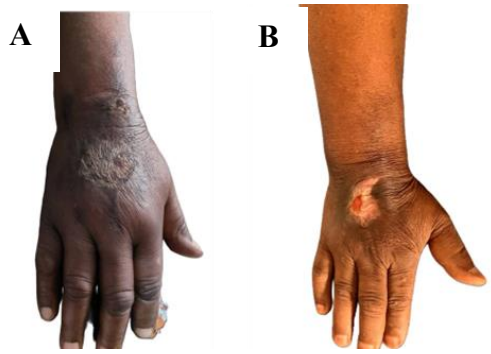

Figure 3. Extravasation following AC chemotherapy. (A) Necrotic plaque on the dorsum of the right hand observed on day 17 of the cycle, corresponding to grade 3 according to CTCAE v5.0. (B) Scar appearance three months after surgical excision of the lesions, which led to a temporary interruption of treatment.

Discussion

CRCL, such as phlebitis and extravasation, represent frequent clinical challenges that remain underreported, especially in resource-limited settings. These complications not only impair patient quality of life but also threaten treatment continuity. In our study conducted at Donka University Hospital, Guinea, we observed a notable incidence of phlebitis and extravasation closely linked to contextual, structural, and organizational factors specific to low-resource environments.

In our study, 35.2% of patients experienced at least one CRLC episode, corresponding to 26.4% of the 193 chemotherapy cycles administered. Phlebitis was the most common complication (15.0% of cycles), followed by extravasation (11.4%). These rates exceed those reported in some well-resourced settings but remain lower than incidences documented in other low-resource contexts where phlebitis prevalence may exceed 30% (14,15). Conversely, in high-resource countries, extravasation incidence remains very low (<1%), despite peripheral venous access being a known risk factor for vesicant agents (16).

A major determinant of CRLC in our study was the near-exclusive use of peripheral venous access. Unlike well-equipped centers where central venous devices (implantable ports, central catheters) are commonly used, these devices are rarely available in our context due to economic and supply constraints. This results in repeated punctures at a limited number of sites, creating a favorable environment for phlebitis and extravasation. This pattern aligns with findings from other studies on chemotherapy local complications in sub-Saharan Africa and other low-resource settings (14,17,18).

Our findings confirm that CRLC are influenced by structural, organizational, and clinical factors specific to our environment. The absence of standardized management protocols, shortages of specific antidotes, and insufficient healthcare staff training contribute to both the occurrence and suboptimal management of

these events. Additionally, the high frequency of locally advanced cancer stages treated with aggressive chemotherapy protocols increases the risk of local toxicities, especially with vesicant agents like anthracyclines and docetaxel. These factors combine with individual risk factors previously described in the literature, including venous fragility, obesity, comorbidities, and lymphedema (19–21).

Therapeutically, anthracycline-based protocols and docetaxel monotherapy were the most frequently used, both classes known for local toxicity. Anthracyclines, being vesicants, pose a significant risk of tissue necrosis in case of extravasation, requiring timely administration of specific antidotes such as dexrazoxane within six hours, alongside appropriate physical measures (cold or heat, depending on the agent) (8, 9, 19, 22). Docetaxel, an irritant agent, can cause local reactions like phlebitis or skin eruptions, often occurring shortly after infusion (22, 23).

Most CRCL occurred during the first four cycles, consistent with other studies such as Roberts et al. (12), who reported 27% of patients developing severe phlebitis after three anthracycline cycles. This phenomenon may be explained by vein fragility during initial infusions, absence of progressive adaptation, and concentration of infusions on a limited number of venous sites. This underscores the importance of vigilant monitoring and preventive strategies early in treatment.

Management primarily involved symptomatic measures (infusion cessation, site change, local care). Severe cases (9.1%) required surgical excision, leading to temporary chemotherapy interruption but no permanent functional sequelae. These findings highlight the critical need for early and adequate management to prevent complications from worsening.

However, this study has some limitations. The sample size and the relatively short duration of data collection (3 months) may limit the scope of the results and their generalization. Furthermore, the lack of immediate paraclinical diagnostic tools, such as emergency Doppler ultrasound or thermography, may have led to an underestimation of lesions, particularly for extravasation. Additionally, the fact that this study is monocentric and primarily descriptive also prevents the establishment of firm causal links between the studied factors and the observed complications.

Despite these limitations, the results of this study open several avenues for improving the management of chemotherapy-related local complications in similar contexts. It is crucial to strengthen the continuous training of medical staff and establish standardized protocols for the prevention and treatment of phlebitis and extravasation. The introduction of central venous access devices and the availability of specific antidotes are also priorities for reducing the incidence of these complications. Furthermore, future studies should explore the impact of using central venous access devices on the reduction of local complications and implement more precise diagnostic approaches to improve early detection. Finally, research could focus on the evaluation of early management of complications in a resource-limited setting, in order to better prevent long-term sequelae.

Conclusion

Our study highlights a high frequency of CRLC, mainly phlebitis and extravasation, in a resource-limited setting. These events, often early and moderately severe, are favored by the near-exclusive use of peripheral venous access and remain underreported, partly due to structural and organizational constraints hindering their prevention and optimal management.

These results underscore the urgent need to improve the safety of oncological care through realistic and context-appropriate measures: enhancing staff competencies, educating patients, and improving access to secure venous devices and specific treatments. Such interventions would contribute to preserving patient quality of life, preventing treatment interruptions, and ensuring safer, more equitable care.

Despite its limitations, this study provides original prospective data from a Francophone African setting that is underrepresented in the literature. It calls for multicentric research and healthcare system strengthening strategies to reduce the impact of these

complications on the treatment journey of cancer patients in Guinea and similar contexts.

Author contribution

BT conceived the study. **AMC** and **IKC** collected and analyzed the data. **IKC** and **AMC** drafted and revised the manuscript. **BT** and **KC** supervised the study and validated the scientific content. All authors reviewed and approved the final manuscript.

Conflicts of interest

There are no conflicts of interest.

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