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Odor symptom management in patients with malignant wounds in Mali: the use of a cinnamon dressing

Charlotte Ngô[1*], Fatoumata M Sidibe[2], Sophie Goossens[1], Dianeko Zenabou Tapa[1], Irène Kriegel[1], Abdramane A Kone[2], Moussa Bathily[2], Hamidou D Doumbia[2], Claire Rieux[1] and Isabelle Fromantin[3]

Abstract

Background In Mali, cancer patients are often diagnosed at stage III or IV. Tumor wounds are more frequent and associated with malodorous exudates, responsible for an altered quality of life and stigmatization of patients. Cinesteam® Cinnamon Dressing is an adsorbent dressing designed to reduce odors. This study aimed at demonstrating the feasibility of routine use of cinnamon dressing in the Malian context, and to assess its effect on tumor wound odors.

Patients and methods This is a prospective observational pilot study conducted jointly by the oncology department of the Point G University hospital in Bamako and Médecins Sans Frontières France. Included patients suffered from a malignant malodourous wound and were treated with cinnamon dressing. The primary endpoint was wound odor. Secondary endpoints were appetite, duration of dressing efficacy and ease of use.

Results Forty patients were included in this pilot study. Complete data and follow-up were available for 19 patients only. The odor score reported by patients was significantly decreased after 10 days of cinnamon dressing (odor score 1.7 versus 3.3, t-test 0.00003). Seventeen patients reported that the CINESTEAM® dressing was easy to use, even for patients receiving home-based palliative care in remote areas. The dressing provided an odor control that lasted more than 24 h. One year after inclusion, more than half of the patients had died of their cancer, indicating a very advanced stage at diagnosis. The cinnamon dressing had no effect on appetite, but most of the patients were undergoing palliative chemotherapy, which may account for this result.

Conclusion The use of innovative dressings is feasible, even in very deprived contexts, and might decrease the discomfort linked with unpleasant odors in tumoral wounds. Odor management is crucial to restore self-esteem and to prevent patients' stigma and isolation.

Keywords Malignant wounds, Odor, Wound care, Cinnamon dressing

*Correspondence:
Charlotte Ngô
charlotte.ngo2@gmail.com
[1]Médecins Sans Frontières, Operating Center of Paris, 14-24 avenue Jean Jaurès, Paris 75019, France
[2]Service d'hématologie et d'Oncologie médicale, Centre Hospitalier Universitaire du Point G, Bamako, Mali
[3]Research and wound care Unit, Curie institute, Paris, France

Background

Between 5 and 15% of patients with metastatic cancer develop a malignant fungating wound [1]. This figure is poorly documented but appears to be much higher in low-income countries, where patients are usually managed at a late stage of disease, often due to a lack of access to care. The most common malignancies in sub-Saharan Africa are cervical and breast cancers, which are most commonly diagnosed at stages III and IV (75% of cases) in this region [2].

Symptoms associated with malignant wounds include pain, risk of bleeding, infection, exudate, and odor [3]. Odor is specifically linked to the presence of bacteria in the tumor necrosis or to a patent infection and has major impacts not only for the patient's quality of life, but also on that of those around them (isolation, feelings of repulsion) and on caregivers, nurses and doctors. An evaluation of volatile organic compounds (VOCs) emanating from tumoral wounds in the breast has highlighted the presence of many potentially malodorous compounds including organo-sulfuric compounds and phenol [4]. The production of organo-sulfuric compounds and phenol is frequently reported in the literature on VOCs emitted by decomposing bodies. The association between the smell of these VOCs and the cadaverous state seems strong, which could explain the aversive effect from which patients suffer [4].

Until recently, anti-odor dressings, mainly charcoal dressings, had the advantage of being neither antibiotic nor antiseptic (therefore without risk of selection pressure or cytotoxicity) but were only partially effective on this symptom [5, 6]. In order to offer effective and inexpensive solutions that take into account cross-cultural differences in the perception of odors, new ways of dressing have therefore been explored, leading to an interest in turmeric [7] and cinnamon. Cinnamon is a widely used spice in Asia, derived from the inner bark of the Cinnamomum Zeylanicum tree (or Ceylon cinnamon tree). Cinnamon essential oil is known to have anti-tumor, antimicrobial, anti-inflammatory, and antifungal properties [8]. In various formulations, it also has an effect on healing, but the evidence is limited to in vitro and in vivo studies in murine models [9]. It has been shown that spices have superior adsorptive properties compared to activated charcoal in terms of sensory perception, likely because in addition to adsorption, their own VOCs mask the odors of unadsorbed foul-smelling VOCs [10]. Since 2020, a cinnamon dressing (Cinesteam® CEMAG CARE) has been developed as an alternative to charcoal dressings. Cinesteam® is the only sterile secondary dressing using cinnamon (without contact with the wound - class 1) which retains the odorous volatile compounds from wounds (like charcoal) while masking residual bad odors by emitting a natural spice smell.

According to the International Agency for Research on Cancer, there will be over 15,000 new cases of cancer in Mali in 2022, and more than 10,000 deaths from cancer [11], mostly from breast and cervical cancer. These figures are certainly underestimates. Because of the difficulty of accessing specialized care, ignorance of the disease and tenacious beliefs, patients often turn to traditional healers when they are diagnosed with the disease. Despite the efforts made by public authorities to treat cancers, remission cases are still rare in Mali, and the treatment process remains extremely complicated and financially out of reach for many, which is why patients arrive at the hospital at advanced stages of disease. Doctors Without Borders (Médecins Sans Frontières, MSF) started an oncology project in Mali in October 2018, supporting the national health system in Bamako with cervical and breast cancer screening, providing access to specific treatment (chemotherapy, surgery, and radiotherapy when possible) and ensuring palliative care [12]. From 2020 to 2023, around 800 new patients with cancer were treated each year in Point G's Hospital. 80% of patients arrived with an advanced stage of disease (stage III or stage IV). Among them, some patients had malignant wounds, leading to the provision of more than 2500 wound dressings per year. MSF, together with Institute Curie and Point G hospital in Bamako, conducted a feasibility study of the use of Cinesteam® on malignant wound in routine care.

Patients and methods

Study design

This study was a prospective observational monocentric study on cancer patients with malodorous malignant wounds, regardless of the origin of the tumor, treated by the Cinesteam® dressing and followed by MSF and Point G Hospital nurses in the haemato-Oncology department of the Point G hospital in Bamako, Mali. The study was approved by the Mali's national ethics committee and conducted in accordance with the Declaration of Helsinki.

Inclusion criteria

Eligible patients were those over 18 years of age, with a malodorous malignant wound, who provided informed consent. The healthcare professionals in charge gave the patient written and/or oral information during the consultation interview. They ensured that the patient understood and gave informed consent during this exchange.

Dressing procedure

The treatments were carried according to the standard of care depending on the needs of the wound to drain, whether it needed an oily dressing or an interface, or was associated with compresses or an absorbent dressing.

The Cinesteam® dressing was added on the top of the main dressing, as an anti-odor dressing. The procedure was carried out by health care professionals who had been trained by oncology nurses from the MSF mission and repeated every day or every other day, either at the hospital or at home by the mobile clinic team. An evaluation was conducted 8 days after the first use of the cinnamon dressing.

Data collection and evaluation

From the medical records, the following patients characteristics were retrieved and collected in a case report file (CRF): age, gender, localisation of the tumor, date of first visit for cinnamon dressing, date of second visit, size of the wound, wound appearance (fungating or hollowing), odor perception (intensity and qualitative assessment: patients were asked to describe the odor with their own words, completely freely), ongoing antibiotics, ongoing chemotherapy, total number of dressing used during between the 2 visits. The study's primary endpoint was a comparison of the patient's discomfort linked to odor using a score on Day 0 (before application of Cinesteam®) and Day 8 (during the patient's 2nd clinical evaluation), as graded by the patient themselves (0 = no odor, 1 = non-unpleasant odor, 2 = slightly unpleasant odor, 3 = unpleasant odor, 4 = very unpleasant odor, 5 = extremely unpleasant odor). Combining previously published scale, we used this 6 points scale in order to avoid a neutral opinion from the patient [13]. Secondary objectives were to evaluate the effect of the dressing on appetite, assuming that reducing unpleasant odors may improve patients' appetite, as well as the duration of effectiveness of the dressing and the dressing's ease of use. Appetite was reported by the patient as "normal appetite" or "no appetite" at first and second visit. Patients were asked at second visit if they noticed an improvement of appetite as compared to first visit, with a yes/no question. The duration of effectiveness of the dressing was noticed ≤ 24 h or > 24 h. The dressing's ease of use was evaluated by the caregivers and the patients by a single question: easy/difficult.

Fig. 1 Example of breast tumor wound treated in oncology department of Point G hospital in Bamako with the support of MSF

Statistics

We performed an observational descriptive analysis without an a priori hypothesis. Due to small sample size, we used non-parametric test for the primary endpoint. The comparison of odor scores before and after the use of cinnamon dressing was performed by a paired Mann-Whitney test and is reported as median [Q25-Q75].

Results

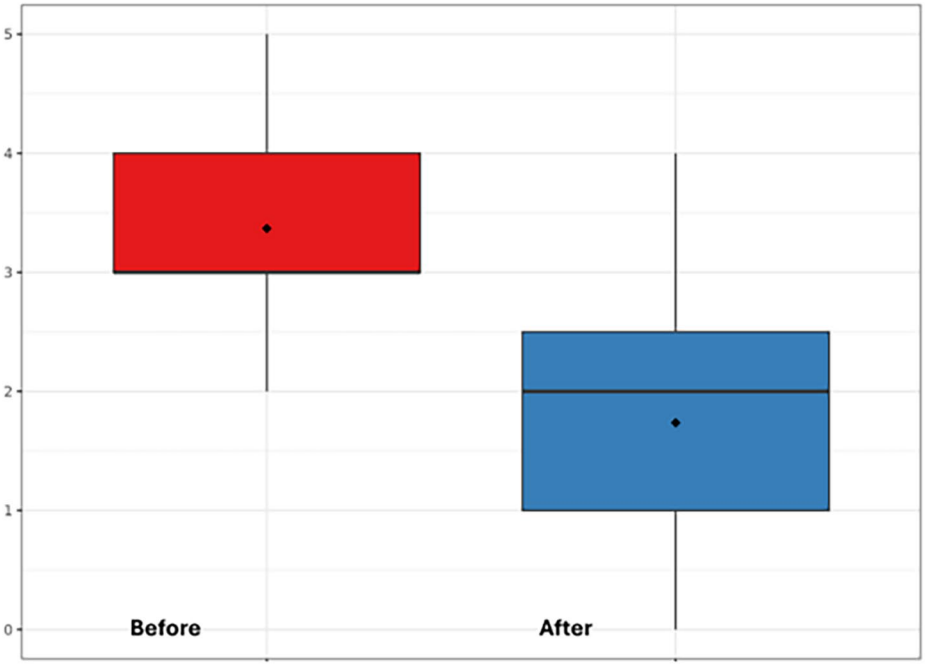
Forty patients were included. CRF was complete for 19 patients. One year after inclusion, more than half of the patients included had died of their cancer, indicating a very advanced stage at diagnosis. The median delay between the two clinical assessment visits was 10 days, range [6–40]. The total number of dressing used during this period was 5, i.e. one dressing every other day. Thirteen patients were treated for breast cancer (Fig. 1), other patients were treated for head and neck cancer, vulvar cancer or osteo-sarcoma. All the 19 patients received chemotherapy at some point in their care.

The discomfort linked with odor reported by patients was significantly decreased after 10 days of cinnamon dressing ($p < 0.001$). Among the 19 patients, 17 reported an improvement in odor, one patient reported that odor was unchanged while one patient reported a worsening of their discomfort. Patients' characteristics are summarized in Tables 1 and Fig. 2.

The most common descriptive term for wound smells was "rotten meat" or "rotten food" for 16 patients. For three patients, the descriptive terms were "dead thing" or "decomposing corpse". Seventeen patients reported that the CINESTEAM® dressing was easy to use and that the effectiveness of the dressing on odor control lasted more than 24 h. Thirteen patients continued to use the dressing after a 2nd clinical assessment. Among included patients, cinnamon dressing had no effect on appetite. At their 2nd clinical visit, 58% of patients were receiving

Table 1 Patients' characteristics and secondary outcome

N **= 19**	**1rst visit assessment**	**2nd visit assessment**
Age mean ± SD	39 ± 10	
Gender male/female	2/17 11%/89%	
BMI (kg/m^2 mean ± SD)	25 ± 6	24 ± 6
Tumor location	13 (68%)	
Breast	4 (21%)	
Other	2 (11%)	
NA		
Tumor size in cm (mean ± SD)	21 ± 11	20 ± 11
Wound appearance	10	
Fungating	9	
Hollowing		
Concomitant Chemotherapy	6 (31%)	11 (58%)
Type of associate dressing	5	5
Alginate	6	4
Tulle gras	6	3
Other	2	7
NA		
Delay between the2 visits (in days, median [range])	-	10 [6–40]
Total number of dressings used during the period (median [range])		5[1–10]
Loss of Appetite	10 (53%)	11 (58%)
Duration of effectiveness of the cinnamon dressing > 24 h	-	17 (89%)
Dressing is easy to use	-	17 (89%)
Continuation of the use of cinnamon dressing after the study	-	13 (68%)



	before (n = 19)	after (n = 19)	Δ mean	p	test
Odor Score median [Q 25-75]	3.00 [3.00; 4.00]	2.00 [1.00; 2.50]	-1.63	**<0.001**	Paired Mann-Whitney

Fig. 2 Primary outcome: Evolution of odor rating before and after the use of cinnamon dressing. 0 = no odor, 1 = odor not unpleasant, 2 = odor a little unpleasant, 3 = unpleasant odor, 4 = very unpleasant odor, 5 = extremely unpleasant odor

palliative chemotherapy versus 31% at first visit. No allergic reactions to the dressing were reported, and no adverse events occurred.

Discussion

This study demonstrates the feasibility and acceptability of using innovative dressings requiring specific resources for managing tumor wounds in difficult context such as the Malian actual situation (low-income country, lack of medical equipment, lack of human resources, political instability, security concerns). The majority of caregivers and patients found the dressing easy to use, including for repeated applications every 24 to 48 h. There was a significant reduction in odors and good acceptance of the dressing, as the majority of patients continued to use it after the study. Despite reductions in unpleasant odor, there was no impact on appetite seen in this cohort. Most of these patients, however, were also undergoing palliative chemotherapy at an advanced stage of disease, which may account for this result.

Tumor wounds are difficult to manage. They are often progressive and require careful, repeated, and communicated evaluation (report, treatment plan, and photo). The management of tumor wounds is based on three principles: symptom management, wound treatment, and treatment of the underlying cancer. This management combines local treatments, cancer-specific systemic treatments, and supportive care. The primary goal is to relieve pain and reduce odors to lessen the stigma suffered by the patient. The risk of bleeding must be considered, as it is increased by the aggressive care sometimes necessary (debridement), especially in certain locations where a vital prognosis may be at stake (head and neck). The often-abundant exudates determine the frequency of dressing changes. In case of infection, antibiotics are necessary, especially since patients are often immunocompromised. The diagnosis of infection is primarily clinical (increase in exudates and pain, peri-lesional redness, rapid change in the wound, general symptoms). These signs can sometimes be misleading in tumor wounds due to the cutaneous infiltration of the tumor and the progression of the disease.

Odor control usually relies on a two steps treatment: manage the biocontamination (by cleaning, debriding, controlling exudate and using antibacterial treatment) and mask or adsorb odors. The most commonly used anti-odor solutions are silver dressings, activated charcoal dressings, and honey [14–16]. Activated charcoal is a porous material that provides a large adsorption surface for gases, bacteria, and liquids. It traps VOCs responsible for fetid odors. Honey has antibacterial properties and also serves as an alternative nutrient for the bacteria present in the wound, leading to the production of lactic acid as a bacterial waste product instead of sulfur compounds responsible for bad odors. Silver has antimicrobial and anti-inflammatory activity. It indirectly reduces odors by destroying bacteria. However, the literature is limited, results are controversial with negative studies, and there are very few controlled studies comparing different types of dressings. Tumor wounds occur at advanced stages that are rare in high-income countries, and research in this area is poor. The most recent reviews report barely a dozen studies with correct methodology, with very small samples [17–19]. According to these publications, silver dressings and topical metronidazole use seem to reduce odors compared to a placebo. There is no evidence for other types of dressings, but studies are rare, with small patient samples and varying evaluation criteria. Quality of life is never assessed in these publications. Odor can also cause therapeutic issues, especially the excessive prescription of antibiotics. Inappropriate antibiotic use increases the risk of drug interactions and selection pressure, which lead to antibiotic resistance and destabilization in the bacterial colonization equilibrium, as well as other possible side effects [20]. In countries where cancer is a scary and taboo subject, the appearance of foul odors can also rapidly worsen a patient's isolation. It is therefore essential to develop new solutions to control odors emanating from tumor wounds.

Another interesting result of our study is the patient's perception of tumor wounds odor as smelling like "rotten meat," a nearly universal description across Africa, Asia, and Europe, where the three most commonly used terms by patients to describe the wound odor are: garbage, rotten meat, or corpse-like. Hedonic valence and olfactory empathy are determined by an individual's experience and culture, but also by the structure of the odor molecule. Despite the lack of cultural proximity to cinnamon in our specific cohort, this dressing was well accepted by the patients and caregivers in our study. Not all spices are adsorbent [21]. All cinnamons are, but the particularity of Cinesteam® cinnamon is its stability and sterility. Using other cinnamons would not necessarily be reproducible.

Our study is a pilot feasibility study and therefore has limitations: it was a non-comparative observational study with a small sample in a humanitarian medical context with very impaired patients. This led to significant loss of follow-up and missing data. Nevertheless, we show that cinnamon dressing is acceptable and provides a significant reduction of odor intensity using it every other day. The cost of this strategy was not evaluated in our study. The dressing we tested is not currently marketed in Sub-Saharan Africa; we were able to benefit from a donation. The price in Europe is 5.4 euros per unit. This price would obviously not be affordable for low-income countries, but we cannot extrapolate a cost study as the market does not yet exist. Nevertheless, demonstrating the feasibility and acceptability of this medical device for the treatment of

tumor wounds in a highly constrained humanitarian context may make the case for market access.

Conclusion

Malodorous wounds are a source of stigma, devaluation, and social exclusion, particularly for women with advanced breast cancer in sub-Saharan Africa. Controlling tumor-related unpleasant odors is crucial to restoring self-esteem and improving patients' quality of life. We show that the use of innovative adsorbent dressings is possible with substantial potential benefits for patients. These results should be confirmed in a larger comparative cohort evaluating the effect of cinnamon on odors, but also on quality of life, in the specific context of low-income countries with lack of access to oncological and supportive care.

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Author contributions
CN: conception, design, analysis, interpretation of data, draft of the manuscript FS: design, interpretation of data, draft of the manuscript SG: acquisition, revision of the manuscript DZT: acquisition, revision of the manuscript IK: conception, design, draft of the manuscript AAK: acquisition, revision of the manuscript MB: acquisition, revision of the manuscript HDD: acquisition, revision of the manuscript CR: design, revision of the manuscript IF: conception, design, interpretation of data, draft of the manuscript. All authors have approved the submitted version and have agreed both to be personally accountable for the author's own contributions and to ensure that questions related to the accuracy or integrity of any part of the work, even ones in which the author was not personally involved, are appropriately investigated, resolved, and the resolution documented in the literature.

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Data availability
Data is provided within the manuscript.

Declarations

Ethics approval and consent to participate
the study received the approval of the Comité National d'Ethique pour la Santé et les Sciences de la Vie, Bamako, Mali (Mali's national ethics committee based in Bamako). All patients gave their informed consent to participate.

Consent for publication
patients gave their consent for publication of pictures.

Competing interests
The authors declare no competing interests.

Clinical trial number
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